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DRINKING WATER SURVEILLANCE PROGRAM

OTTAWA (BRITANNIA) WATER SUPPLY SYSTEM

ANNUAL REPORT 1990

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OTTAWA (BRITANNIA)
WATER SUPPLY SYSTEM

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EXECUTIVE SUMMARY

DRINKING WATER SURVEILLANCE PROGRAM

OTTAWA WATER SUPPLY SYSTEM (BRITANNIA)
1990 ANNUAL REPORT

The Drinking Water Surveillance Program (DWSP) for Ontario is a monitoring program providing immediate, reliable, current information on drinking water quality. The DWSP officially began in April 1986 and is designed to eventually include all municipal supplies in Ontario. In 1990, 76 systems were being monitored.

The Ottawa (Britannia) water treatment plant is a conventional treatment plant which treats water from the Ottawa River. The process consists of coagulation, flocculation, sedimentation, filtration, post pH adjustment, fluoridation and disinfection. This plant has a rated capacity of 245.0 x 1000 m^3/day. The Ottawa (Britannia) water treatment plant together with the Ottawa (Lemieux Island) water treatment plant serves a population of approximately 523,800.

Water at the plant and at two locations in the distribution system was sampled for the presence of approximately 180 parameters. Parameters were divided into the following groups: bacteriological, inorganic and physical (laboratory chemistry, field chemistry and metals), and organic (chloroaromatics, chlorophenols, pesticides and PCB, phenolics, polyaromatic hydrocarbons, specific pesticides and volatiles). Samples were analyzed for specific pesticides and chlorophenols twice a year in the spring and fall.

Table A is a summary of all results by group.

No known health related guidelines were exceeded.

The Ottawa (Britannia) water treatment plant, for the sample year 1990, produced good quality water and this was maintained in the distribution system.

TABLE A

DRINKING WATER SURVEILLANCE PROGRAM OTTAWA WSS (BRITANNIA)

SUMMARY TABLE BY SCAN

A POSITIVE VALUE DENOTES THAT THE RESULT IS GREATER THAN THE STATISTICAL LIMIT OF DETECTION AND IS QUANTIFIABLE
A '.' INDICATES THAT NO SAMPLE WAS TAKEN

SCAN	SITE RAW TESTS	RAW POSITIVE	RAW %POSITIVE	TREATED TESTS	TREATED POSITIVE	TREATED %POSITIVE	SITE 1 TESTS	SITE 1 POSITIVE	SITE 1 %POSITIVE	SITE 2 TESTS	SITE 2 POSITIVE	SITE 2 %POSITIVE
BACTERIOLOGICAL	15	15	100	5	0	0	5	2	40	6	6	100
CHEMISTRY (FLD)	18	18	100	36	36	100	54	54	100	72	72	100
CHEMISTRY (LAB)	126	108	85	128	109	85	162	148	91	217	203	93
METALS	144	53	36	144	40	27	207	75	36	276	102	36
CHLOROAROMATICS	84	0	0	70	0	0	70	0	0	84	0	0
CHLOROPHENOLS	12	0	0	12	0	0	.	.	.	.	.	.
PAH	102	0	0	102	0	0	17	0	0	17	0	0
PESTICIDES & PCB	204	0	0	182	0	0	106	0	0	127	0	0
PHENOLICS	6	1	16	6	2	33	.	.	.	.	.	.
SPECIFIC PESTICIDES	46	0	0	57	0	0	5	0	0	6	0	0
VOLATILES	174	1	0	174	18	10	145	15	10	145	15	10
TOTAL	931	196		916	205		771	294		950	398	

DRINKING WATER SURVEILLANCE PROGRAM

OTTAWA WATER SUPPLY SYSTEM (BRITANNIA)
1990 ANNUAL REPORT

INTRODUCTION

The Drinking Water Surveillance Program (DWSP) for Ontario is a monitoring program providing immediate, reliable, current information on drinking water quality. The DWSP officially began in April 1986 and is designed to eventually include all municipal supplies in Ontario. In 1990, 76 systems were being monitored.

Appendix A has a full description of the DWSP.

The DWSP was initiated for the Ottawa (Britannia) water treatment plant in 1987. Previous annual reports have been published for 1987, 1988 and 1989.

PLANT DESCRIPTION

The Ottawa (Britannia) water treatment plant is a conventional treatment plant which treats water from the Ottawa River. The process consists of coagulation, flocculation, sedimentation, filtration, post pH adjustment, fluoridation and disinfection. This plant has a rated capacity of 245.0 x 1000 m^3/day. The Ottawa (Britannia) water treatment plant together with the Ottawa Lemieux water treatment plant serves a population of approximately 515,500.

The sample day flows ranged from 96.0 x 1000 m^3/day to 250.0 x 1000 m^3/day.

General plant information is presented in Table 1 and a schematic of plant processes, chemical addition points and sampling locations in Figure 1.

SAMPLING AND ANALYSES

Sample lines in the plant were flushed prior to sampling to ensure that the water obtained was indicative of its origin and not residual water standing in the sample line.

At all distribution system locations two types of samples were obtained, a standing and a free flow. The standing sample consisted of water that had been in the household plumbing and service connection for a minimum of six hours. These samples were used to make an assessment of the change in the levels of inorganic

compounds and metals, due to leaching from, or deposition on, the plumbing system. The only analyses carried out on the standing samples therefore, were General Chemistry and Metals. The free flow sample represented fresh water from the distribution main, since the sample tap was flushed for five minutes prior to sampling.

Attempts were made to capture the same block of water at each sampling point by taking the retention time into consideration. Retention time was calculated by dividing the volume of water between two sampling points by sample day flow. For example, if it was determined that retention time within the plant was five hours, then there would be a five hour interval between the raw and treated sampling. Similarly, if it was estimated that it took approximately one day for the water to travel from the plant to the distribution system site, this site would be sampled one day after the treated water from the plant.

Stringent DWSP sampling protocols were followed to ensure that all samples were taken in a uniform manner (see Appendix B).

Plant operating personnel routinely analyze parameters for process control (Table 2).

Water at the plant and at two locations in the distribution system was sampled for the presence of approximately 180 parameters. Parameters were divided into the following groups: bacteriological, inorganic and physical (laboratory chemistry, field chemistry and metals), and organic (chloroaromatics, chlorophenols, pesticides and PCB, phenolics, polyaromatic hydrocarbons, specific pesticides and volatiles). Samples were analyzed for specific pesticides and chlorophenols twice a year in the spring and fall. Laboratory analyses were conducted at the Ministry of the Environment facilities in Rexdale, Ontario.

RESULTS

Field measurements were recorded on the day of sampling and were entered onto the DWSP database as submitted by plant personnel.

Table 3 contains information on delay time between raw and treated water sampling, flow rate, and treatment chemical dosages.

Table 4 is a summary break-down of the number of water samples analyzed by parameter and by water type. The number of times that a positive or trace result was detected is also reported.

Positive denotes that the result is greater than the statistical limit of detection established by the Ministry of the Environment laboratory staff and is quantifiable. Trace (<T) denotes that the level measured is greater than the lowest value detectable by the method but lies so close to the detection limit that it cannot be

confidently quantified.

Table 5 presents the results for parameters detected on at least one occasion.

Table 6 lists all parameters analyzed in the DWSP.

Associated guidelines and detection limits are also supplied on tables 5 and 6. Parameters are listed alphabetically within each scan.

DISCUSSION

GENERAL

Water quality was judged by comparison with the Ontario Drinking Water Objectives (ODWOs). When an ODWO was not available guidelines/limits from other agencies were consulted. The Parameter Listing System (PALIS) published guidelines for 650 parameters from agencies throughout the world.

IN THIS REPORT, DISCUSSION IS LIMITED TO:

- **THE TREATED AND DISTRIBUTED WATER;**
- **ONLY THOSE PARAMETERS WITH CONCENTRATIONS ABOVE GUIDELINE VALUES; AND**
- **POSITIVE ORGANIC PARAMETERS DETECTED.**

BACTERIOLOGICAL

Guidelines for bacteriological sampling and testing of a supply are developed to maintain a proper supervision of its bacteriological quality; the routine monitoring program usually requires the taking of multiple samples in a given system. Full interpretation of bacteriological quality cannot be made on the basis of single samples.

Standard plate count is a test used to supplement routine analysis for coliform bacteria. The limit for standard plate count (at 35°C after 48 hours) in the ODWOs is 500 counts/mL (based on a geometric mean of 5 or more samples). DWSP bacteriological analysis of treated and distributed water was limited to standard plate count.

Standard plate count (membrane filtration) exceeded the ODWO Maximum Desirable Concentration of 500 counts/mL in 2 of 6 distributed water samples with a maximum reported value of 2,400 counts/mL.

INORGANIC & PHYSICAL

CHEMISTRY (FIELD)

Field pH exceeded the ODWO Aesthetic or Recommended Operational Guideline of 6.5-8.5 pH units in 2 of 6 treated water samples with a maximum reported value of 8.9 pH units. The lab pH also had several exceedances of the guideline. Raising the pH was part of the treatment process and was used to control corrosion in the distribution system.

It is desirable that the temperature of drinking water be less than 15°C. The palatability of water is enhanced by its coolness. A temperature below 15°C will tend to reduce the growth of nuisance organisms and hence minimize associated taste, colour, odour and corrosion problems. The temperature of the delivered water may increase in the distribution system due to the warming effect of the soil in late summer and fall and/or as a result of higher temperatures in the source water.

Field temperature exceeded the ODWO Maximum Desirable Concentration of 15°C in 6 of 17 treated and distributed water samples with a maximum reported value of 24.0°C.

CHEMISTRY (LAB)

Alkalinity was below the ODWO Aesthetic or Recommended Operational Guideline of 30-500 mg/L in 11 of 17 treated and distributed water samples with a minimum reported value of 20.6 mg/L.

Colour in drinking water may be due to the presence of natural or synthetic substances as well as certain metallic ions.

Colour exceeded the ODWO Maximum Desirable Concentration of 5 Hazen Units (HZU) in 3 of 17 treated and distributed water samples with a maximum reported value of 6.0 HZU.

METALS

At present, there is no evidence that aluminum is physiologically harmful and no health limit for drinking water has been specified. The measure of aluminum in treated water is important to indicate the efficiency of the treatment process. The ODWOs indicate that a useful guideline is to maintain a residual below 100 ug/L as aluminum in the water leaving the plant, to avoid problems in the distribution system.

Aluminum exceeded the ODWO Aesthetic or Recommended Operational Guideline of 100 ug/L in 6 of 17 treated and distributed water samples with a maximum reported value of 120.0 ug/L.

ORGANIC

CHLOROAROMATICS

The results of the chloroaromatic scan showed that none were detected above trace levels.

CHLOROPHENOLS

The results of the chlorophenol scan showed that none were detected above trace levels.

POLYAROMATIC HYDROCARBONS (PAH)

The results of the PAH scan showed that none were detected in the treated and distributed samples.

PESTICIDES & PCB

The results of the PCB scan showed that none were detected.

The results of the regular pesticides scan showed that none were detected above trace levels.

PHENOLICS

Phenolic compounds are present in the aquatic environment as a result of natural and/or industrial processes. The ODWOs recommend, as an operational guideline, that phenolic substances in drinking water not exceed 2.0 ug/L. This limit has been set primarily to prevent undesirable taste and odours, particularly in chlorinated water. No results exceeded the guideline.

SPECIFIC PESTICIDES

The results of the specific pesticides scan showed that none were detected.

VOLATILES

The detection of benzene, ethylbenzene, toluene and xylenes at low, trace levels may be a laboratory artifact derived from the analytical methodology.

Trihalomethanes (THMs) are produced during the water treatment process and will always occur in chlorinated waters. THMs are comprised of chloroform, chlorodibromomethane and dichlorobromomethane; bromoform occurs occasionally. Results are reported for the individual compounds as well as for total THMs. Only total THMs results are discussed.

Total THMs were found at positive levels in the 16 treated and distributed water samples analyzed with a maximum level of 222.0 ug/L. This was below the ODWO Maximum Acceptable Concentration of 350 ug/L.

CONCLUSIONS

The Ottawa (Britannia) water treatment plant, for the sample year 1990, produced good quality water and this was maintained in the distribution system.

No known health related guidelines were exceeded.

Figure 1

OTTAWA (BRITANNIA) WATER TREATMENT PLANT

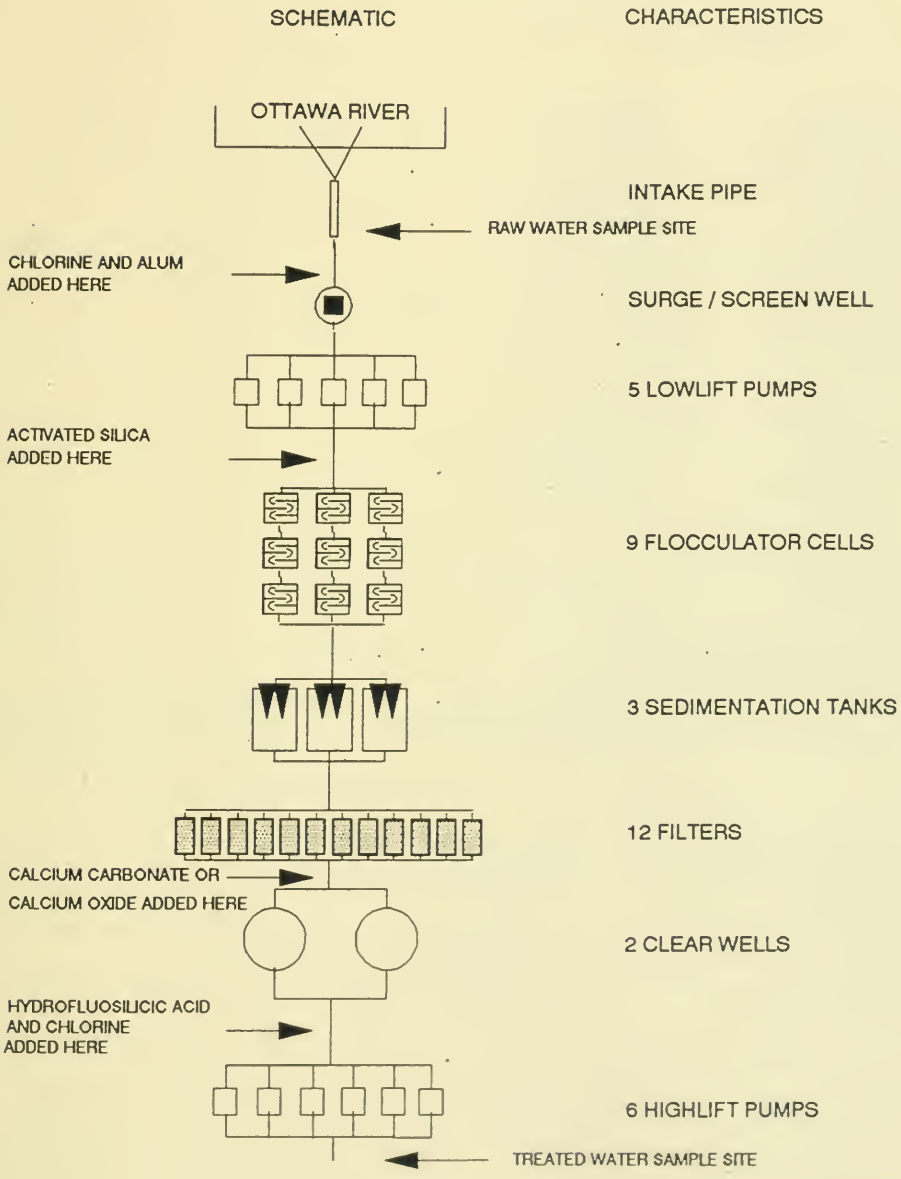

TABLE 1

DRINKING WATER SURVEILLANCE PROGRAM

PLANT GENERAL REPORT

WORKS #: 220003154
PLANT NAME: OTTAWA WSS (BRITANNIA WTP)

DISTRICT: OTTAWA
REGION: SOUTHEAST
DISTRICT OFFICER: R. DUNN

UTM #: 1843881205024700

PLANT SUPERINTENDENT: A. HARTRY

ADDRESS: CASSELS ROAD
OTTAWA, ONTARIO

(Telephone) (613 828 2727)

MUNICIPALITY: OTTAWA-CARLTON
AUTHORITY: MUNICIPAL

PLANT INFORMATION:

PLANT VOLUME:	40.670	**(x 1000 m3)**
DESIGN CAPACITY:	0.000	**(x 1000 m3/day)**
RATED CAPACITY:	245.000	**(x 1000 m3/day)**

MUNICIPALITY:	**POPULATION:**
CITY OF OTTAWA	304,000
GLOUCESTER	76,589
GOULBOURN	9,720
KANATA	20,529
NEPEAN	85,737
VANIER	18,877

TABLE 2
DRINKING WATER SURVEILLANCE PROGRAM
IN-PLANT MONITORING

PARAMETER	LOCATION	FREQUENCY
ALUMINUM	TREATED WATER	WEEKLY
COMBINED CHLORINE RESIDUAL	SETTLED WATER IN LAB	DAILY READING
	FILTERED WATER IN LAB	DAILY READING
	AFTER MIXERS	DAILY READING
TOTAL CHLORINE RESIDUAL	TREATED WATER IN LAB	DAILY READING
	SETTLED WATER IN LAB	DAILY READING
	FILTERED WATER IN LAB	DAILY READING
	AFTER MIXERS	DAILY READING
	TREATED WATER	CONTINUOUS
FLUORIDE	TREATED WATER IN LAB	DAILY READING
	TREATED WATER	CONTINUOUS
PH	TREATED WATER IN LAB	DAILY READING
	FILTERED WATER IN LAB	DAILY READING
	RAW WATER IN LAB	DAILY READING
	AFTER MIXERS	DAILY READING
	RAW WATER	CONTINUOUS
	TREATED WATER	CONTINUOUS
SILICA	TREATED WATER IN LAB	WEEKLY
	RAW WATER IN LAB	WEEKLY
TURBIDITY	TREATED WATER IN LAB	DAILY READING
	SETTLED WATER IN LAB	DAILY READING
	FILTERED WATER IN LAB	DAILY READING
	AFTER FILTERS	16 TIMES PER DAY
	RAW WATER IN LAB	DAILY READING
	AFTER SETTLING TANKS	CONTINUOUS
	TREATED WATER	DAILY READING

TABLE 3
DRINKING WATER SURVEILLANCE PROGRAM OTTAWA WSS (BRITANNIA) SAMPLE DAY CONDITIONS FOR 1990

			TREATMENT CHEMICAL DOSAGE (MG/L)						
			PRE CHLORINATION	COAGULATION	COAGULATION AID	FLUORIDATION	ACTIVATION	POST PH ADJUSTMENT	POST CHLORINATION
			CHLORINE	ALUM LIQUID	SODIUM SILICATE	HYDROFLUOSILICIC ACID	ALUM LIQUID	CALCIUM OXIDE	CHLORINE
DATE	DELAY * TIME(HRS)	FLOW (1000M3)							
JAN 24	3.80	250.000	1.10	34.00	4.00	1.00	8.00	8.60	1.20
MAR 27	6.40	141.000	1.00	38.00	2.50	1.00	5.00	8.60	1.00
MAY 29	9.40	96.000	1.60	31.00	1.50	1.00	3.00	8.60	1.00
JUL 25	4.85	186.000	3.00	22.00	1.00	1.00	2.00	8.60	1.50
SEP 26	6.40	141.000	2.80	26.00	1.00	1.00	2.00	8.60	1.50
NOV 27	4.51	186.000	2.20	30.00	2.00	1.00	4.00	8.60	1.30

* THE DELAY TIME BETWEEN THE RAW AND TREATED WATER SAMPLING, SHOULD ESTIMATE THE RETENTION TIME.

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM OTTAWA WSS (BRITANNIA)
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	RAW			TREATED			SITE 1			SITE 2		
	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
BACTERIOLOGICAL												
FECAL COLIFORM MF	5	5	0	.	.	.	.	.	.	.	.	.
STANDRD PLATE CNT MF	.	.	.	5	0	0	5	2	0	6	6	0
TOTAL COLIFORM MF	5	5	0	.	.	.	.	.	.	.	.	.
T COLIFORM BCKGRD MF	5	5	0	.	.	.	.	.	.	.	.	.
*TOTAL SCAN BACTERIOLOGICAL	15	15	0	5	0	0	5	2	0	6	6	0
*TOTAL GROUP BACTERIOLOGICAL	15	15	0	5	0	0	5	2	0	6	6	0
CHEMISTRY (FLD)												
FLD CHLORINE (COMB)	.	.	.	6	6	0	9	9	0	12	12	0
FLD CHLORINE FREE	.	.	.	6	6	0	9	9	0	12	12	0
FLD CHLORINE (TOTAL)	.	.	.	6	6	0	9	9	0	12	12	0
FLD PH	6	6	0	6	6	0	9	9	0	12	12	0
FLD TEMPERATURE	6	6	0	6	6	0	9	9	0	12	12	0
FLD TURBIDITY	6	6	0	6	6	0	9	9	0	12	12	0
*TOTAL SCAN CHEMISTRY (FLD)	18	18	0	36	36	0	54	54	0	72	72	0
CHEMISTRY (LAB)												
ALKALINITY	6	6	0	6	6	0	9	9	0	12	12	0
CALCIUM	6	6	0	6	6	0	9	9	0	12	12	0
CYANIDE	6	0	0	6	0	0	.	.	.	.	.	.
CHLORIDE	6	6	0	6	6	0	9	9	0	12	12	0
COLOUR	6	6	0	6	4	1	9	9	0	12	12	0
CONDUCTIVITY	6	6	0	6	6	0	9	9	0	12	12	0
DISS ORG CARBON	6	6	0	6	6	0	9	9	0	12	12	0
FLUORIDE	6	3	3	6	6	0	9	9	0	12	12	0
HARDNESS	6	6	0	6	6	0	9	9	0	12	12	0
IONCAL	6	6	0	6	6	0	9	9	0	12	12	0
LANGELIERS INDEX	0	0	0	2	2	0	0	0	0	1	1	0
MAGNESIUM	6	6	0	6	6	0	9	9	0	12	12	0
SODIUM	6	6	0	6	6	0	9	9	0	12	12	0
AMMONIUM TOTAL	6	3	1	6	2	1	9	2	3	12	4	2
NITRITE	6	4	2	6	1	4	9	2	7	12	6	6
TOTAL NITRATES	6	6	0	6	6	0	9	9	0	12	12	0
NITROGEN TOT KJELD	6	6	0	6	6	0	9	9	0	12	12	0
PH	6	6	0	6	6	0	9	9	0	12	12	0
PHOSPHORUS FIL REACT	6	3	3	6	5	1	.	.	.	.	.	.
PHOSPHORUS TOTAL	6	5	1	6	5	1	.	.	.	.	.	.
SULPHATE	6	6	0	6	6	0	9	9	0	12	12	0
TURBIDITY	6	6	0	6	6	0	9	9	0	12	12	0
*TOTAL SCAN CHEMISTRY (LAB)	126	108	10	128	109	8	162	148	10	217	203	8

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM OTTAWA WSS (BRITANNIA)
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	RAW			TREATED			SITE 1			SITE 2		
	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
METALS												
SILVER	6	0	0	6	0	0	9	0	0	12	0	0
ALUMINUM	6	6	0	6	6	0	9	9	0	12	12	0
ARSENIC	6	0	6	6	0	6	9	0	9	12	0	12
BARIUM	6	6	0	6	6	0	9	9	0	12	12	0
BORON	6	0	6	6	0	6	9	0	9	12	0	12
BERYLLIUM	6	0	0	6	0	0	9	0	0	12	0	1
CADMIUM	6	0	0	6	0	0	9	0	2	12	0	1
COBALT	6	0	6	6	0	5	9	0	7	12	0	10
CHROMIUM	6	0	3	6	0	3	9	0	5	12	0	9
COPPER	6	6	0	6	0	6	9	5	4	12	12	0
IRON	6	6	0	6	0	6	9	0	9	12	0	11
MERCURY	6	0	0	6	0	0	.	.	.	.	.	.
MANGANESE	6	6	0	6	6	0	9	9	0	12	12	0
MOLYBDENUM	6	0	6	6	0	6	9	0	9	12	0	12
NICKEL	6	0	6	6	0	4	9	0	5	12	0	7
LEAD	6	1	5	6	0	3	9	6	3	12	6	6
ANTIMONY	6	0	6	6	0	6	9	3	6	12	4	8
SELENIUM	6	0	0	6	0	1	9	0	0	12	0	0
STRONTIUM	6	6	0	6	6	0	9	9	0	12	12	0
TITANIUM	6	6	0	6	4	2	9	7	2	12	8	4
THALLIUM	6	0	0	6	0	0	9	0	0	12	0	0
URANIUM	6	0	4	6	0	0	9	0	1	12	0	0
VANADIUM	6	4	2	6	6	0	9	9	0	12	12	0
ZINC	6	6	0	6	6	0	9	9	0	12	12	0
*TOTAL SCAN METALS	144	53	50	144	40	54	207	75	71	276	102	93
*TOTAL GROUP INORGANIC & PHYSICAL	288	179	60	308	185	62	423	277	81	565	377	101
CHLOROAROMATICS												
HEXACHLOROBUTADIENE	6	0	0	5	0	0	5	0	0	6	0	0
123 TRICHLOROBENZENE	6	0	0	5	0	0	5	0	0	6	0	0
1234 T-CHLOROBENZENE	6	0	0	5	0	0	5	0	0	6	0	0
1235 T-CHLOROBENZENE	6	0	0	5	0	0	5	0	0	6	0	0
124 TRICHLOROBENZENE	6	0	0	5	0	0	5	0	0	6	0	0
1245 T-CHLOROBENZENE	6	0	0	5	0	0	5	0	0	6	0	0
135 TRICHLOROBENZENE	6	0	0	5	0	0	5	0	0	6	0	0
HCB	6	0	0	5	0	0	5	0	0	6	0	0
HEXACHLOROETHANE	6	0	0	5	0	0	5	0	1	6	0	1
OCTACHLOROSTYRENE	6	0	0	5	0	0	5	0	0	6	0	0
PENTACHLOROBENZENE	6	0	0	5	0	0	5	0	0	6	0	0
236 TRICHLOROTOLUENE	6	0	0	5	0	0	5	0	0	6	0	0
245 TRICHLOROTOLUENE	6	0	0	5	0	0	5	0	0	6	0	0
26A TRICHLOROTOLUENE	6	0	0	5	0	0	5	0	0	6	0	0
*TOTAL SCAN CHLOROAROMATICS	84	0	0	70	0	0	70	0	1	84	0	1
CHLOROPHENOLS												

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM OTTAWA WSS (BRITANNIA)
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	RAW			TREATED			SITE 1			SITE 2		
	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
234 TRICHLOROPHENOL	2	0	0	2	0	0	.	.	.	.	.	.
2345 T-CHLOROPHENOL	2	0	0	2	0	0	.	.	.	.	.	.
2356 T-CHLOROPHENOL	2	0	0	2	0	0	.	.	.	.	.	.
245-TRICHLOROPHENOL	2	0	0	2	0	0	.	.	.	.	.	.
246-TRICHLOROPHENOL	2	0	0	2	0	2	.	.	.	.	.	.
PENTACHLOROPHENOL	2	0	0	2	0	0	.	.	.	.	.	.
*TOTAL SCAN CHLOROPHENOLS	12	0	0	12	0	2	0	0	0	0	0	0
PAH												
PHENANTHRENE	6	0	1	6	0	0	1	0	0	1	0	0
ANTHRACENE	6	0	0	6	0	0	1	0	0	1	0	0
FLUORANTHENE	6	0	0	6	0	0	1	0	0	1	0	0
PYRENE	6	0	0	6	0	0	1	0	0	1	0	0
BENZO(A)ANTHRACENE	6	0	0	6	0	0	1	0	0	1	0	0
CHRYSENE	6	0	0	6	0	0	1	0	0	1	0	0
DIMETH. BENZ(A)ANTHR	6	0	0	6	0	0	1	0	0	1	0	0
BENZO(E) PYRENE	6	0	0	6	0	0	1	0	0	1	0	0
BENZO(B) FLUORANTHEN	6	0	0	6	0	0	1	0	0	1	0	0
PERYLENE	6	0	0	6	0	0	1	0	0	1	0	0
BENZO(K) FLUORANTHEN	6	0	0	6	0	0	1	0	0	1	0	0
BENZO(A) PYRENE	6	0	0	6	0	0	1	0	0	1	0	0
BENZO(G,H,I) PERYLEN	6	0	0	6	0	0	1	0	0	1	0	0
DIBENZO(A,H) ANTHRAC	6	0	0	6	0	0	1	0	0	1	0	0
INDENO(1,2,3-C,D) PY	6	0	0	6	0	0	1	0	0	1	0	0
BENZO(B) CHRYSENE	6	0	0	6	0	0	1	0	0	1	0	0
CORONENE	6	0	0	6	0	0	1	0	0	1	0	0
*TOTAL SCAN PAH	102	0	1	102	0	0	17	0	0	17	0	0
PESTICIDES & PCB												
ALDRIN	6	0	0	5	0	0	5	0	0	6	0	0
ALPHA BHC	6	0	3	5	0	2	5	0	1	6	0	2
BETA BHC	6	0	0	5	0	0	5	0	0	6	0	0
LINDANE	6	0	0	5	0	0	5	0	0	6	0	0
ALPHA CHLORDANE	6	0	0	5	0	0	5	0	0	6	0	0
GAMMA CHLORDANE	6	0	0	5	0	0	5	0	0	6	0	0
DIELDRIN	6	0	0	5	0	0	5	0	0	6	0	0
METHOXYCHLOR	6	0	0	5	0	0	5	0	0	6	0	0
ENDOSULFAN 1	6	0	0	5	0	0	5	0	0	6	0	0
ENDOSULFAN II	6	0	0	5	0	0	5	0	0	6	0	0
ENDRIN	6	0	0	5	0	0	5	0	0	6	0	0
ENDOSULFAN SULPHATE	6	0	0	5	0	0	5	0	0	6	0	0
HEPTACHLOR EPOXIDE	6	0	0	5	0	0	5	0	0	6	0	0
HEPTACHLOR	6	0	0	5	0	0	5	0	0	6	0	0
MIREX	6	0	0	5	0	0	5	0	0	6	0	0
OXYCHLORDANE	6	0	0	5	0	0	5	0	0	6	0	0
OPDDT	6	0	0	5	0	0	5	0	0	6	0	0
PCB	6	0	0	5	0	0	5	0	0	6	0	0
DDD	6	0	0	5	0	0	5	0	0	6	0	0
PPDDE	6	0	0	5	0	0	5	0	0	6	0	0

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM OTTAWA WSS (BRITANNIA)
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	RAW			TREATED			SITE 1			SITE 2		
	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
PPDDT	6	0	0	5	0	0	5	0	0	6	0	0
AMETRINE	6	0	0	6	0	0	.	.	.	.	.	.
ATRAZINE	6	0	0	6	0	0	.	.	.	.	.	.
ATRATONE	6	0	0	6	0	0	.	.	.	.	.	.
CYANAZINE (BLADEX)	6	0	0	6	0	0	.	.	.	.	.	.
DESETHYLATRAZINE	6	0	0	6	0	0	.	.	.	.	.	.
D-ETHYL SIMAZINE	6	0	0	6	0	0	.	.	.	.	.	.
PROMETONE	6	0	0	6	0	0	.	.	.	.	.	.
PROPAZINE	6	0	0	6	0	0	.	.	.	.	.	.
PROMETRYNE	6	0	0	6	0	0	.	.	.	.	.	.
METRIBUZIN (SENCOR)	5	0	0	5	0	0	.	.	.	.	.	.
SIMAZINE	6	0	0	6	0	0	.	.	.	.	.	.
ALACHLOR (LASSO)	6	0	0	6	0	0	.	.	.	.	.	.
METOLACHLOR	6	0	0	6	0	0	.	.	.	.	.	.
HEXACLCYCLOPENTADIEN	1	0	0	.	.	.	1	0	1	1	0	0
*TOTAL SCAN PESTICIDES & PCB	204	0	3	182	0	2	106	0	2	127	0	2
PHENOLICS												
PHENOLICS	6	1	1	6	2	3	.	.	.	.	.	.
*TOTAL SCAN PHENOLICS	6	1	1	6	2	3	0	0	0	0	0	0
SPECIFIC PESTICIDES												
TOXAPHENE	6	0	0	5	0	0	5	0	0	6	0	0
2,4,5-T	2	0	0	2	0	0	.	.	.	.	.	.
2,4-D	2	0	0	2	0	0	.	.	.	.	.	.
2,4-DB	2	0	0	2	0	0	.	.	.	.	.	.
2,4 D PROPIONIC ACID	2	0	0	2	0	0	.	.	.	.	.	.
DICAMBA	2	0	0	2	0	0	.	.	.	.	.	.
PICHLORAM	0	0	0	0	0	0	.	.	.	.	.	.
SILVEX	2	0	0	2	0	0	.	.	.	.	.	.
DIAZINON	1	0	0	2	0	0	.	.	.	.	.	.
DICHLOROVOS	1	0	0	2	0	0	.	.	.	.	.	.
CHLORPYRIFOS	1	0	0	2	0	0	.	.	.	.	.	.
ETHION	1	0	0	2	0	0	.	.	.	.	.	.
AZINPHOS-METHYL	0	0	0	0	0	0	.	.	.	.	.	.
MALATHION	1	0	0	2	0	0	.	.	.	.	.	.
MEVINPHOS	1	0	0	2	0	0	.	.	.	.	.	.
METHYL PARATHION	1	0	0	2	0	0	.	.	.	.	.	.
METHYLTRITHION	1	0	0	2	0	0	.	.	.	.	.	.
PARATHION	1	0	0	2	0	0	.	.	.	.	.	.
PHORATE	1	0	0	2	0	0	.	.	.	.	.	.
RELDAN	1	0	0	2	0	0	.	.	.	.	.	.
RONNEL	1	0	0	2	0	0	.	.	.	.	.	.
AMINOCARB	0	0	0	0	0	0	.	.	.	.	.	.
BENONYL	0	0	0	0	0	0	.	.	.	.	.	.
BUX	0	0	0	0	0	0	.	.	.	.	.	.
CARBOFURAN	2	0	0	2	0	0	.	.	.	.	.	.
CICP	2	0	0	2	0	0	.	.	.	.	.	.
DIALLATE	2	0	0	2	0	0	.	.	.	.	.	.

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM OTTAWA WSS (BRITANNIA)
SUMMARY TABLE OF RESULTS (1990)

SCAN. PARAMETER	RAW			TREATED			SITE 1			SITE 2		
	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
EPTAM	2	0	0	2	0	0	.	.	.	.	.	.
IPC	2	0	0	2	0	0	.	.	.	.	.	.
PROPOXUR	2	0	0	2	0	0	.	.	.	.	.	.
CARBARYL	2	0	0	2	0	0	.	.	.	.	.	.
BUTYLATE	2	0	0	2	0	0	.	.	.	.	.	.
*TOTAL SCAN SPECIFIC PESTICIDES	46	0	0	57	0	0	5	0	0	6	0	0
VOLATILES												
BENZENE	6	0	1	6	0	2	5	0	1	5	0	1
TOLUENE	6	0	1	6	0	1	5	0	1	5	0	1
ETHYLBENZENE	6	0	1	6	0	2	5	0	2	5	0	1
P-XYLENE	6	0	0	6	0	0	5	0	0	5	0	0
M-XYLENE	6	0	0	6	0	1	5	0	0	5	0	0
O-XYLENE	6	0	0	6	0	0	5	0	0	5	0	0
STYRENE	6	0	4	6	0	2	5	0	3	5	0	1
1,1 DICHLOROETHYLENE	6	0	0	6	0	0	5	0	0	5	0	0
METHYLENE CHLORIDE	6	0	0	6	0	0	5	0	0	5	0	0
T1,2DICHLOROETHYLENE	6	0	0	6	0	0	5	0	0	5	0	0
1,1 DICHLOROETHANE	6	0	0	6	0	0	5	0	0	5	0	0
CHLOROFORM	6	1	4	6	6	0	5	5	0	5	5	0
111, TRICHLOROETHANE	6	0	1	6	0	0	5	0	0	5	0	0
1,2 DICHLOROETHANE	6	0	0	6	0	0	5	0	0	5	0	0
CARBON TETRACHLORIDE	6	0	0	6	0	0	5	0	0	5	0	0
1,2 DICHLOROPROPANE	6	0	0	6	0	0	5	0	0	5	0	0
TRICHLOROETHYLENE	6	0	0	6	0	0	5	0	0	5	0	0
DICHLOROBROMOMETHANE	6	0	0	6	6	0	5	5	0	5	5	0
112 TRICHLOROETHANE	6	0	0	6	0	0	5	0	0	5	0	0
CHLORODIBROMOMETHANE	6	0	0	6	0	0	5	0	0	5	0	0
T-CHLOROETHYLENE	6	0	0	6	0	0	5	0	0	5	0	0
BROMOFORM	6	0	0	6	0	0	5	0	0	5	0	0
1122 T-CHLOROETHANE	6	0	0	6	0	0	5	0	0	5	0	0
CHLOROBENZENE	6	0	0	6	0	0	5	0	0	5	0	0
1,4 DICHLOROBENZENE	6	0	0	6	0	0	5	0	0	5	0	0
1,3 DICHLOROBENZENE	6	0	0	6	0	0	5	0	0	5	0	0
1,2 DICHLOROBENZENE	6	0	0	6	0	0	5	0	0	5	0	0
ETHLYENE DIBROMIDE	6	0	0	6	0	0	5	0	0	5	0	0
TOTL TRIHALOMETHANES	6	0	2	6	6	0	5	5	0	5	5	0
*TOTAL SCAN VOLATILES	174	1	14	174	18	8	145	15	7	145	15	4
*TOTAL GROUP ORGANIC	628	2	19	603	20	15	343	15	10	379	15	7

KEY TO TABLE 5 and 6

A ONTARIO DRINKING WATER OBJECTIVES (ODWO)
1. Maximum Acceptable Concentration (MAC)
1+. MAC for Total Trihalomethanes
2. Interim Maximum Acceptable Concentration (IMAC)
3. Aesthetic Objective (AO)
3*. AO for Total Xylenes
4. Recommended Operational Guideline

B HEALTH & WELFARE CANADA (H&W)
1. Maximum Acceptable Concentration (MAC)
2. Proposed MAC
3. Interim MAC
4. Aesthetic Objective (AO)

C WORLD HEALTH ORGANIZATION (WHO)
1. Guideline Value (GV)
2. Tentative GV
3. Aesthetic GV

D US ENVIRONMENTAL PROTECTION AGENCY (EPA)
1. Maximum Contaminant Level (MCL)
2. Suggested No-Adverse Effect Level (SNAEL)
3. Lifetime Health Advisory
4. EPA Ambient Water Quality Criteria
4T. EPA Ambient Water Quality Criteria for Total PAH

F EUROPEAN ECONOMIC COMMUNITY (EEC)
1. Health Related Guideline Level
2. Aesthetic Guideline Level
3. Maximum Admissable Concentration (MADC)

G CALIFORNIA STATE DEPARTMENT OF HEALTH-GUIDELINE VALUE

I NEW YORK STATE AMBIENT WATER GUIDELINE

N/A NONE AVAILABLE

LABORATORY RESULTS, REMARK DESCRIPTIONS

.	No Sample Taken
BDL	Below Minimum Measurement Amount
<T	Greater Than Detection Limit But Not Confident (SEE INTERPRETATION OF RESULTS ABOVE)
>	Results Are Greater Than The Upper Limit
<=>	Approximate Result
!CS	No Data: Contamination Suspected
!IL	No Data: Sample Incorrectly Labelled
!IS	No Data: Insufficient Sample
!IV	No Data: Inverted Septum
!LA	No Data: Laboratory Accident
!LD	No Data: Test Queued After Sample Discarded
!NA	No Data: No Authorization To Perform Reanalysis
!NP	No Data: No Procedure
!NR	No Data: Sample Not Received
!OP	No Data: Obscured Plate
!QU	No Data: Quality Control Unacceptable
!PE	No Data: Procedural Error - Sample Discarded
!PH	No Data: Sample pH Outside Valid Range
!RE	No Data: Received Empty
!RO	No Data: See Attached Report (no numeric results)
!SM	No Data: Sample Missing
!SS	No Data: Send Separate Sample Properly Preserved
!UI	No Data: Indeterminant Interference
!TX	No Data: Time Expired
A3C	Approximate, Total Count Exceeded 300 Colonies
APL	Additional Peak, Large, Not Priority Pollutant
APS	Additional Peak, Less Than, Not Priority Pollutant
CIC	Possible Contamination, Improper Cap
CRO	Calculated Result Only
PPS	Test Performed On Preserved Sample
RMP	P and M-Xylene Not Separated
RRV	Rerun Verification
RVU	Reported Value Unusual
SPS	Several Peaks, Small, Not Priority Pollutant

UCR		Unreliable: Could Not Confirm By Reanalysis
UCS		Unreliable: Contamination Suspected
UIN		Unreliable: Indeterminate Interference
XP		Positive After X Number Of Hours
T#	(T06)	Result Taken After # Hours

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM OTTAWA WSS (BRITANNIA) 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
BACTERIOLOGICAL						
FECAL COLIFORM MF (CT/100ML)			DET'N LIMIT = 0	GUIDELINE = 0 (A1)		
JAN	22	.	.	.	.	.
MAR	4	.	.	.	.	.
MAY	18	.	.	.	.	.
SEP	158	.	.	.	.	.
NOV	34	.	.	.	.	.
STANDRD PLATE CNT MF (COUNT/ML)			DET'N LIMIT = 0	GUIDELINE = 500/ML (A3)		
JAN	.	0 <=>	.	1 <=>	.	10
MAR	.	1 <=>	.	0 <=>	.	30
MAY	.	1 <=>	.	26	.	2400 >
JUL	.	.	.	55	.	1300
SEP	.	2 <=>	.	.	.	80
NOV	.	1 <=>	.	5 <=>	.	19
TOTAL COLIFORM MF (CT/100ML)			DET'N LIMIT = 0	GUIDELINE = 5/100ML(A1)		
JAN	100	.	.	.	.	.
MAR	1440	.	.	.	.	.
MAY	320	.	.	.	.	.
SEP	320	.	.	.	.	.
NOV	460	.	.	.	.	.
T COLIFORM BCKGRD MF (CT/100ML)			DET'N LIMIT = 0	GUIDELINE = N/A		
JAN	5200	.	.	.	.	.
MAR	24000 >	.	.	.	.	.
MAY	32000	.	.	.	.	.
SEP	9600	.	.	.	.	.
NOV	1800	.	.	.	.	.

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM OTTAWA WSS (BRITANNIA) 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
CHEMISTRY (FLD)						
FLD CHLORINE (COMB) (MG/L)			DET'N LIMIT = 0	GUIDELINE = N/A		
JAN	.	.590	.050	.200	.050	.100
MAR	.	.400	.100	.050	.100	.200
MAY	.	.200	.100	.050	.100	.200
JUL	.	.130	.050	.050	.050	.050
SEP	.	.200	.	.	.050	.050
NOV	.	.200	.	.100	.050	.050
FLD CHLORINE FREE (MG/L)			DET'N LIMIT = 0	GUIDELINE = N/A		
JAN	.	.560	.050	.100	.050	.100
MAR	.	.700	.100	.150	.100	.100
MAY	.	1.100	.100	.150	.100	.100
JUL	.	1.420	.050	.050	.100	.100
SEP	.	1.700	.	.	.100	.100
NOV	.	1.400	.	.200	.100	.100
FLD CHLORINE (TOTAL) (MG/L)			DET'N LIMIT = 0	GUIDELINE = N/A		
JAN	.	1.150	.100	.300	.100	.200
MAR	.	1.200	.200	.200	.200	.300
MAY	.	1.300	.200	.200	.200	.300
JUL	.	1.550	.100	.100	.150	.150
SEP	.	1.900	.	.	.150	.150
NOV	.	1.600	.	.300	.150	.150
FLD PH (DMNSLESS)			DET'N LIMIT = N/A	GUIDELINE = 6.5-8.5(A4)		
JAN	7.000	8.000	7.700	7.900	7.600	8.200
MAR	7.000	8.400	8.100	8.100	7.800	8.300
MAY	7.200	8.600	8.100	8.000	8.000	8.000
JUL	7.300	8.000	8.000	8.000	7.800	7.900
SEP	7.200	8.900	.	.	8.200	8.300
NOV	7.000	8.200	.	7.500	7.500	7.900
FLD TEMPERATURE (DEG.C)			DET'N LIMIT = N/A	GUIDELINE = 15 (A3)		
JAN	.400	.300	27.000	10.000	20.000	9.000
MAR	5.000	3.000	28.000	6.000	20.000	4.000
MAY	16.000	15.200	26.000	11.000	20.000	12.000
JUL	24.200	24.000	23.000	17.000	21.000	18.000
SEP	16.500	16.500	.	.	21.000	18.000
NOV	8.500	6.000	.	12.000	22.000	11.000
FLD TURBIDITY (FTU)			DET'N LIMIT = N/A	GUIDELINE = 1 (A1)		
JAN	2.000	.550	.370	.220	.400	.320
MAR	9.000	.530	.370	.980	.450	.390
MAY	2.300	.350	.430	.350	.300	.300
JUL	1.900	.260	.180	.240	.330	.250
SEP	1.840	.380	.	.	.300	.300
NOV	3.200	.340	.	.200	.590	.390

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM OTTAWA WSS (BRITANNIA) 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
CHEMISTRY (LAB)						
ALKALINITY (MG/L)			DET'N LIMIT = 0.2	GUIDELINE = 30-500 (A3)		
JAN	25.500	30.700	33.300	66.200	32.600	32.400
MAR	30.800	38.000	38.200	37.000	38.500	38.600
MAY	20.100	28.900	27.800	26.000	28.100	26.900
JUL	19.000	20.600	22.000	21.900	23.000	22.900
SEP	21.700	28.100	.	.	28.300	28.000
NOV	22.700	25.200	.	24.900	27.500	26.800
CALCIUM (MG/L)			DET'N LIMIT = 0.2	GUIDELINE = 100 (F2)		
JAN	10.900	20.800	21.200	21.400	22.300	22.200
MAR	12.200	24.600	24.600	24.000	24.800	24.800
MAY	9.200	20.600	18.900	19.000	19.800	19.500
JUL	9.660	15.400	16.100	15.800	16.600	16.500
SEP	8.600	19.800	.	.	20.400	20.000
NOV	10.300	19.500	.	19.300	20.600	20.200
CHLORIDE (MG/L)			DET'N LIMIT = 0.2	GUIDELINE = 250 (A3)		
JAN	3.600	5.600	5.800	47.800	5.500	5.500
MAR	3.800	5.400	5.400	5.400	5.800	5.800
MAY	2.700	4.800	5.100	4.900	4.900	4.800
JUL	2.300	6.000	5.500	5.300	5.300	5.300
SEP	2.700	5.900	.	.	6.200	6.200
NOV	2.900	5.400	.	5.400	5.300	5.400
COLOUR (NZU)			DET'N LIMIT = 0.5	GUIDELINE = 5 (A3)		
JAN	43.000	6.000	6.000	5.500	6.000	5.500
MAR	31.500	3.500	4.000	4.000	4.000	3.000
MAY	37.000	2.000 <T	3.000	2.500	2.500	2.500
JUL	34.000	3.000	4.000	4.000	4.000	4.000
SEP	25.500	3.000	.	.	3.500	3.000
NOV	35.000	BDL	.	3.000	3.500	3.500
CONDUCTIVITY (UMHO/CM)			DET'N LIMIT = 1.	GUIDELINE = 400 (F2)		
JAN	90	153	156	398	160	160
MAR	98	168	170	168	171	171
MAY	75	138	137	134	137	135
JUL	67	117	119	119	121	121
SEP	77	134	.	.	138	138
NOV	88	141	.	141	144	144
DISS ORG CARBON (MG/L)			DET'N LIMIT = .100	GUIDELINE = 5.0 (A3)		
JAN	6.300	3.600	3.600	-	3.300	3.200
MAR	6.100	2.700	2.500	2.600	2.600	2.700
MAY	6.000	2.400	2.400	2.500	2.500	2.500
JUL	5.600	3.000	2.900	3.000	2.600	2.600
SEP	5.900	2.900	.	.	2.600	2.700
NOV	6.200	2.800	.	3.000	3.000	2.900

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM OTTAWA WSS (BRITANNIA) 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
FLUORIDE (MG/L)			DET'N LIMIT = 0.01	GUIDELINE = 2.4 (A1)		
JAN	.040 <T	.860	.520	.820	.520	1.040
MAR	.060	1.040	.980	1.000	.980	.980
MAY	.060	1.020	1.000	1.020	.980	.960
JUL	.040 <T	.920	.940	.960	.920	.940
SEP	.060	1.100	.	.	1.060	1.080
NOV	.020 <T	1.000	.	.980	.940	.940
HARDNESS (MG/L)			DET'N LIMIT = 0.5	GUIDELINE = 80-100 (A4)		
JAN	37.400	62.700	63.500	64.500	66.100	66.200
MAR	42.000	73.000	73.000	71.000	74.000	74.000
MAY	31.700	60.600	56.800	56.900	59.200	57.900
JUL	30.900	45.300	47.000	46.400	48.300	47.800
SEP	31.000	59.000	.	.	60.000	59.000
NOV	35.400	58.700	.	58.000	61.100	60.200
IONCAL (DMNSLESS)			DET'N LIMIT = N/A	GUIDELINE = N/A		
JAN	10.600	4.310	.559	17.050	5.730	5.291
MAR	3.012	3.262	3.172	3.440	4.817	5.086
MAY	13.580	6.890	4.348	8.936	8.256	8.984
JUL	13.760	.865	3.810	3.425	6.130	4.021
SEP	.244	7.919	.	.	9.866	7.439
NOV	3.443	7.449	.	8.050	6.747	8.192
LANGELIERS INDEX (DMNSLESS)			DET'N LIMIT = N/A	GUIDELINE = N/A		
JAN	-1.229	-.726	-.744	-.690	-.753	-.747
MAR	-1.212	.263	-.105	-.199	-.079	.102
MAY	-1.429	.350	-.584	-.809	-.719	-.784
JUL	-1.429	-1.194	-1.117	-1.127	-1.055	-1.080
SEP	-1.356	-.357	.	.	-.623	-.456
NOV	-1.453	-.965	.	-1.014	-.874	-.924
MAGNESIUM (MG/L)			DET'N LIMIT = 0.1	GUIDELINE = 30 (F2)		
JAN	2.500	2.550	2.550	2.650	2.550	2.550
MAR	2.800	2.800	2.800	2.800	2.900	2.900
MAY	2.150	2.200	2.300	2.300	2.350	2.250
JUL	1.650	1.700	1.650	1.700	1.650	1.600
SEP	2.300	2.300	.	.	2.300	2.200
NOV	2.350	2.400	.	2.400	2.350	2.400
SODIUM (MG/L)			DET'N LIMIT = 0.2	GUIDELINE = 200 (A4)		
JAN	3.600	4.000	4.100	58.800	4.200	4.000
MAR	2.800	3.400	3.600	3.600	3.800	4.000
MAY	2.900	2.800	3.200	3.100	3.200	3.200
JUL	2.100	2.100	2.300	2.200	2.700	2.500
SEP	2.200	2.600	.	.	2.600	2.600
NOV	2.800	3.100	.	3.300	2.800	3.200

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM OTTAWA WSS (BRITANNIA) 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
AMMONIUM TOTAL (MG/L)			DET'N LIMIT = 0.002	GUIDELINE = 0.05 (F2)		
JAN	.088	.040	.042	.040	BDL	.018
MAR	.064	BDL	BDL	BDL	BDL	.002 <T
MAY	BDL	BDL	BDL	BDL	BDL	BDL
JUL	.006 <T	.006 <T	.008 <T	.002 <T	.004 <T	.012
SEP	BDL	BDL	.	.	BDL	BDL
NOV	.024	.012	.	.002 <T	.014	.020
NITRITE (MG/L)			DET'N LIMIT = 0.001	GUIDELINE = 1 (A1)		
JAN	.003 <T	.002 <T	.006	.002 <T	.002 <T	.002 <T
MAR	.009	.003 <T	.003 <T	.003 <T	.005	.005
MAY	.006	.003 <T	.003 <T	.002 <T	.003 <T	.002 <T
JUL	.005	.001 <T	.002 <T	.002 <T	.005	.007
SEP	.003 <T	BDL	.	.	.002 <T	.003 <T
NOV	.016	.010	.	.012	.013	.010
TOTAL NITRATES (MG/L)			DET'N LIMIT = 0.005	GUIDELINE = 10 (A1)		
JAN	.290	.295	.325	.320	.325	.325
MAR	.255	.270	.270	.250	.255	.250
MAY	.160	.160	.155	.150	.150	.155
JUL	.180	.170	.160	.160	.140	.150
SEP	.170	.180	.	.	.170	.175
NOV	.285	.275	.	.280	.285	.305
NITROGEN TOT KJELD (MG/L)			DET'N LIMIT = 0.02	GUIDELINE = N/A		
JAN	1.180	.260	.290	.820	.230	.240
MAR	.420	.200	.200	.190	.200	.210
MAY	.320	.170	.100	.140	.140	.230
JUL	.320	.150	.170	.180	.180	.180
SEP	.270	.140	.	.	.180	.140
NOV	.370	.160	.	.200	.210	.200
PH (DMNSLESS)			DET'N LIMIT = N/A	GUIDELINE = 6.5-8.5(A4)		
JAN	7.680	7.850	7.790	7.610	7.770	7.780
MAR	7.570	8.680	8.310	8.240	8.330	8.510
MAY	7.650	8.950	8.070	7.870	7.910	7.870
JUL	7.650	7.670	7.700	7.700	7.730	7.710
SEP	7.720	8.270	.	.	7.990	8.170
NOV	7.530	7.720	.	7.680	7.750	7.720
PHOSPHORUS FIL REACT (MG/L)			DET'N LIMIT = 0.0005	GUIDELINE = N/A		
JAN	.004	.008	.	.	.	.
MAR	.006	.001 <T	.	.	.	.
MAY	.004	.009	.	.	.	.
JUL	.001 <T	.004	.	.	.	.
SEP	.000 <T	.004	.	.	.	.
NOV	.001 <T	.004	.	.	.	.

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM OTTAWA WSS (BRITANNIA) 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
PHOSPHORUS TOTAL (MG/L)			DET'N LIMIT = 0.002	GUIDELINE = .40 (F2)		
JAN	.028	.016	.	.	.	.
MAR	.024	.013	.	.	.	.
MAY	.010	.021	.	.	.	.
JUL	.010	.014	.	.	.	.
SEP	.008 <T	.012	.	.	.	.
NOV	.012	.004 <T	.	.	.	.
SULPHATE (MG/L)			DET'N LIMIT = .200	GUIDELINE = 500 (A3)		
JAN	9.260	27.500	28.250	28.430	28.500	28.410
MAR	9.420	29.750	30.160	29.810	29.430	29.510
MAY	8.710	24.580	24.350	23.950	24.430	24.290
JUL	7.970	19.120	18.970	18.790	19.200	19.460
SEP	9.290	21.760	.	.	21.530	21.820
NOV	11.870	25.920	.	25.780	25.900	25.650
TURBIDITY (FTU)			DET'N LIMIT = 0.05	GUIDELINE = 1 (A1)		
JAN	2.500	.650	1.300	.610	1.100	1.900
MAR	9.100	.920	.970	.650	1.000	.340
MAY	2.100	.490	.610	.410	.360	.290
JUL	2.300	.340	.600	.600	.510	.350
SEP	2.100	.460	.	.	.370	.250
NOV	4.000	.370	.	.400	.570	.340

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM OTTAWA WSS (BRITANNIA) 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
METALS						
ALUMINUM (UG/L)			DET'N LIMIT = 0.10	GUIDELINE = 100 (A4)		
JAN	90.000	120.000	120.000	96.000	140.000	120.000
MAR	190.000	68.950	81.000	62.000	85.000	70.000
MAY	120.000	110.000	100.000	83.000	81.000	73.000
JUL	140.000	120.000	120.000	110.000	110.000	120.000
SEP	160.000	64.000	.	.	69.000	65.000
NOV	140.000	96.000	.	76.000	85.000	81.000
ARSENIC (UG/L)			DET'N LIMIT = 0.10	GUIDELINE = 25 (A1)		
JAN	1.000 <T	.300 <T	.410 <T	.300 <T	.610 <T	.480 <T
MAR	.850 <T	.500 <T	.500 <T	.460 <T	.680 <T	.590 <T
MAY	.670 <T	.420 <T	.460 <T	.480 <T	.410 <T	.350 <T
JUL	.820 <T	.790 <T	.740 <T	.740 <T	.690 <T	.610 <T
SEP	.710 <T	.740 <T	.	.	.730 <T	.620 <T
NOV	.850 <T	.570 <T	.	.660 <T	.560 <T	.550 <T
BARIUM (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 1000 (A2)		
JAN	18.000	17.000	20.000	18.000	20.000	17.000
MAR	20.100	17.000	21.000	18.000	19.000	18.000
MAY	18.000	17.000	20.000	17.000	20.000	17.000
JUL	17.000	16.000	17.000	16.000	17.000	17.000
SEP	14.000	16.000	.	.	17.000	17.000
NOV	18.000	15.000	.	16.000	17.000	15.000
BORON (UG/L)			DET'N LIMIT = 2.00	GUIDELINE = 5000 (A1)		
JAN	6.200 <T	5.700 <T	7.500 <T	5.600 <T	6.300 <T	5.600 <T
MAR	7.100 <T	5.700 <T	9.200 <T	7.300 <T	7.900 <T	7.400 <T
MAY	5.400 <T	5.300 <T	5.500 <T	4.800 <T	5.900 <T	5.100 <T
JUL	6.300 <T	6.500 <T	6.200 <T	6.600 <T	6.900 <T	6.100 <T
SEP	8.500 <T	10.000 <T	.	.	11.000 <T	9.000 <T
NOV	6.400 <T	6.100 <T	.	5.800 <T	6.600 <T	5.800 <T
BERYLLIUM (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 6800 (D4)		
JAN	BDL	BDL	BDL	BDL	BDL	BDL
MAR	BDL	BDL	BDL	BDL	BDL	.060 <T
MAY	BDL	BDL	BDL	BDL	BDL	BDL
JUL	BDL	BDL	BDL	BDL	BDL	BDL
SEP	BDL	BDL	.	.	BDL	BDL
NOV	BDL	BDL	.	BDL	BDL	BDL
CADMIUM (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 5 (A1)		
JAN	BDL	BDL	BDL	.060 <T	.070 <T	BDL
MAR	BDL	BDL	BDL	BDL	BDL	BDL
MAY	BDL	BDL	BDL	BDL	BDL	BDL
JUL	BDL	BDL	.080 <T	BDL	BDL	BDL
SEP	BDL	BDL	.	.	BDL	BDL
NOV	BDL	BDL	.	BDL	BDL	BDL

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DRINKING WATER SURVEILLANCE PROGRAM OTTAWA WSS (BRITANNIA) 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
COBALT (UG/L)			DET'N LIMIT = 0.02	GUIDELINE = N/A		
JAN	.210 <T	.120 <T	.170 <T	.120 <T	.140 <T	.150 <T
MAR	.190 <T	.080 <T	.090 <T	.190 <T	.090 <T	.040 <T
MAY	.080 <T	BDL	BDL	BDL	BDL	BDL
JUL	.170 <T	.150 <T	.110 <T	.190 <T	.130 <T	.130 <T
SEP	.090 <T	.100 <T	.	.	.090 <T	.110 <T
NOV	.200 <T	.170 <T	.	.140 <T	.100 <T	.130 <T
CHROMIUM (UG/L)			DET'N LIMIT = 0.50	GUIDELINE = 50 (A1)		
JAN	BDL	.580 <T	.510 <T	BDL	.540 <T	.570 <T
MAR	BDL	BDL	.720 <T	.650 <T	.690 <T	.640 <T
MAY	BDL	BDL	BDL	BDL	BDL	BDL
JUL	.580 <T	BDL	BDL	.530 <T	.540 <T	BDL
SEP	.950 <T	1.100 <T	.	.	1.200 <T	.990 <T
NOV	.980 <T	.790 <T	.	.810 <T	.770 <T	.690 <T
COPPER (UG/L)			DET'N LIMIT = 0.50	GUIDELINE = 1000 (A3)		
JAN	42.000	1.400 <T	36.000	4.700 <T	120.000	9.600
MAR	35.000	1.300 <T	34.000	4.200 <T	76.000	6.400
MAY	52.000	1.400 <T	23.000	2.800 <T	100.000	8.700
JUL	81.000	3.200 <T	3.200 <T	13.000	86.000	16.000
SEP	34.000	1.700 <T	.	.	96.000	16.000
NOV	51.000	3.700 <T	.	9.200	100.000	12.000
IRON (UG/L)			DET'N LIMIT = 6.00	GUIDELINE = 300 (A3)		
JAN	160.000	24.000 <T	18.000 <T	17.000 <T	17.000 <T	14.000 <T
MAR	240.000	17.000 <T	13.000 <T	12.000 <T	9.500 <T	8.800 <T
MAY	150.000	20.000 <T	35.000 <T	22.000 <T	9.100 <T	8.300 <T
JUL	130.000	12.000 <T	19.000 <T	11.000 <T	BDL	11.000 <T
SEP	110.000	19.000 <T	.	.	11.000 <T	9.800 <T
NOV	190.000	16.000 <T	.	18.000 <T	16.000 <T	16.000 <T
MANGANESE (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 50 (A3)		
JAN	13.000	13.000	6.000	8.600	9.000	9.300
MAR	16.000	13.000	6.700	9.400	12.000	11.000
MAY	12.000	10.000	18.000	13.000	6.300	5.800
JUL	16.000	7.400	7.500	7.300	4.200	3.300
SEP	12.000	6.800	.	.	4.700	4.100
NOV	13.000	7.200	.	3.900	4.600	3.700
MOLYBDENUM (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = N/A		
JAN	.240 <T	.220 <T	.230 <T	.240 <T	.170 <T	.190 <T
MAR	.120 <T	.120 <T	.070 <T	.170 <T	.140 <T	.080 <T
MAY	.130 <T	.160 <T	.150 <T	.150 <T	.140 <T	.140 <T
JUL	.110 <T	.130 <T	.220 <T	.150 <T	.120 <T	.110 <T
SEP	.290 <T	.210 <T	.	.	.200 <T	.220 <T
NOV	.220 <T	.250 <T	.	.220 <T	.220 <T	.220 <T

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM OTTAWA WSS (BRITANNIA) 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
NICKEL (UG/L)			DET'N LIMIT = 0.20	GUIDELINE = 350 (D3)		
JAN	1.100 <T	.870 <T	.740 <T	.780 <T	.870 <T	.980 <T
MAR	.570 <T	BDL	BDL	BDL	BDL	BDL
MAY	.490 <T	BDL	BDL	BDL	BDL	BDL
JUL	.650 <T	.220 <T	.840 <T	.280 <T	BDL	.210 <T
SEP	.780 <T	1.300 <T	.	.	.520 <T	.700 <T
NOV	1.000 <T	.660 <T	.	.720 <T	.750 <T	.650 <T
LEAD (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 10. (A1)		
JAN	.230 <T	.080 <T	7.800	.440 <T	6.600	.290 <T
MAR	.570	BDL	6.900	.400 <T	5.000	.190 <T
MAY	.330 <T	BDL	4.900	.360 <T	3.000	.150 <T
JUL	.430 <T	.080 <T	.640	4.600	3.800	.260 <T
SEP	.450 <T	BDL	.	.	2.500	.450 <T
NOV	.410 <T	.060 <T	.	.900	5.200	.230 <T
ANTIMONY (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 146 (D4)		
JAN	.430 <T	.370 <T	.480 <T	.290 <T	.400 <T	.310 <T
MAR	.330 <T	.330 <T	.380 <T	.580	.380 <T	.440 <T
MAY	.300 <T	.380 <T	.500 <T	.380 <T	.440 <T	.500 <T
JUL	.400 <T	.360 <T	.550	.560	.620	.600
SEP	.250 <T	.250 <T	.	.	.530	.550
NOV	.390 <T	.400 <T	.	.370 <T	.500 <T	.390 <T
SELENIUM (UG/L)			DET'N LIMIT = 1.00	GUIDELINE = 10 (A1)		
JAN	BDL	BDL	BDL	BDL	BDL	BDL
MAR	BDL	1.400 <T	BDL	BDL	BDL	BDL
MAY	BDL	BDL	BDL	BDL	BDL	BDL
JUL	BDL	BDL	BDL	BDL	BDL	BDL
SEP	BDL	BDL	.	.	BDL	BDL
NOV	BDL	BDL	.	BDL	BDL	BDL
STRONTIUM (UG/L)			DET'N LIMIT = 0.10	GUIDELINE = N/A		
JAN	48.000	65.000	65.000	63.000	67.000	64.000
MAR	52.000	73.000	73.000	72.000	74.000	73.000
MAY	48.000	61.000	66.000	61.000	64.000	61.000
JUL	37.000	50.000	50.000	51.000	54.000	54.000
SEP	41.000	60.000	.	.	62.000	62.000
NOV	51.000	63.000	.	59.000	62.000	58.000
TITANIUM (UG/L)			DET'N LIMIT = 0.50	GUIDELINE = N/A		
JAN	8.000	7.200	5.700	6.000	6.100	5.400
MAR	13.000	5.670	5.200	5.200	5.900	5.600
MAY	6.600	7.100	6.600	5.300	5.400	5.200
JUL	6.500	4.300 <T	4.300 <T	3.800 <T	4.700 <T	4.200 <T
SEP	5.100	3.300 <T	.	.	3.300 <T	3.300 <T
NOV	10.000	7.100	.	6.300	6.000	5.800

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	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
URANIUM (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 100 (A1)		
JAN	.080 <T	BDL	BDL	BDL	BDL	BDL
MAR	.100 <T	BDL	BDL	BDL	BDL	BDL
MAY	BDL	BDL	BDL	BDL	BDL	BDL
JUL	BDL	BDL	BDL	.070 <T	BDL	BDL
SEP	.060 <T	BDL	.	.	BDL	BDL
NOV	.070 <T	BDL	.	BDL	BDL	BDL
VANADIUM (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = N/A		
JAN	.410 <T	1.400	1.300	1.100	1.600	1.300
MAR	.730	1.260	1.200	1.200	1.500	1.300
MAY	.410 <T	.960	1.200	.960	1.100	.980
JUL	.510	1.100	1.200	1.100	1.200	1.100
SEP	.820	1.000	.	.	1.200	1.100
NOV	.530	.800	.	.720	.910	.710
ZINC (UG/L)			DET'N LIMIT = 0.20	GUIDELINE = 5000 (A3)		
JAN	3.500	3.200	24.000	3.600	16.000	4.100
MAR	4.000	3.000	16.000	3.600	14.000	3.100
MAY	3.700	3.700	12.000	4.000	13.000	3.300
JUL	4.000	3.200	3.900	24.000	14.000	2.700
SEP	2.300	2.900	.	.	17.000	3.600
NOV	8.000	4.300	.	7.400	18.000	3.700

TABLE 5
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	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
CHLOROAROMATICS						
HEXACHLOROETHANE (NG/L)			DET'N LIMIT = 1.000	GUIDELINE = 1900 (D4)		
JAN	BDL	BDL	.	BDL	.	BDL
MAR	BDL	BDL	.	BDL	.	BDL
MAY	BDL	BDL	.	BDL	.	BDL
JUL	BDL	BDL	.	BDL	.	BDL
SEP	BDL	BDL	.	.	.	BDL
NOV	BDL	.	.	6.000 <T	.	3.000 <T
HEXACHLOROCYCLOPENTADIENE (NG/L)			DET'N LIMIT = 5.000	GUIDELINE = 206000 (D4)		
NOV	BDL	.	.	34.000 <T	.	BDL

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	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
CHLOROPHENOLS						
246-TRICHLOROPHENOL (NG/L)			DET'N LIMIT = 20		GUIDELINE = 5000 (A1)	
MAY	BDL	30.000 <T	.	.	.	.
NOV	BDL	170.000 <T	.	.	.	.

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	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
PAH PHENANTHRENE (NG/L)			DET'N LIMIT = 1D.		GUIDELINE = N/A	
JAN	BDL	BDL	.	.	.	.
MAR	BDL	BDL	.	.	.	.
MAY	BDL	BDL	.	.	.	.
JUL	15.000 <T	BDL	.	BDL	.	BDL
SEP	BDL	BDL	.	.	.	.
NOV	BDL	BDL	.	.	.	.

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	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
PESTICIDES & PCB						
ALPHA BHC (NG/L)			DET'N LIMIT = 1.000	GUIDELINE = 700 (G)		
JAN	2.000 <T	1.000 <T	.	BDL	.	2.000 <T
MAR	BDL	BDL	.	BDL	.	BDL
MAY	1.000 <T	1.000 <T	.	1.000 <T	.	BDL
JUL	BDL	BDL	.	BDL	.	BDL
SEP	BDL	BDL	.	.	.	BDL
NOV	1.000 <T	.	.	BDL	.	1.000 <T

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DRINKING WATER SURVEILLANCE PROGRAM OTTAWA WSS (BRITANNIA) 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
PHENOLICS (UG/L PHENOLICS)			DET'N LIMIT = .2	GUIDELINE = 2 (A4)		
JAN	1.600	2.000	.	.	.	.
MAR	.800 <T	1.200	.	.	.	.
MAY	BDL	.600 <T	.	.	.	.
JUL	BDL	BDL	.	.	.	.
SEP	BDL	.400 <T	.	.	.	.
NOV	BDL	.200 <T	.	.	.	.

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM OTTAWA WSS (BRITANNIA) 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
VOLATILES						
BENZENE (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 5 (A1)		
JAN	BDL	BDL	.	BDL	.	BDL
MAR	BDL	.100 <T	.	BDL	.	!BT
MAY	.050 <T	.100 <T	.	.050 <T	.	.050 <T
JUL	BDL	BDL	.	BDL	.	BDL
SEP	BDL	BDL	.	.	.	BDL
NOV	BDL	BDL	.	BDL	.	BDL
TOLUENE (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 24 (A3)		
JAN	BDL	BDL	.	BDL	.	BDL
MAR	BDL	BDL	.	BDL	.	!BT
MAY	.050 <T	.100 <T	.	.100 <T	.	.050 <T
JUL	BDL	BDL	.	BDL	.	BDL
SEP	BDL	BDL	.	.	.	BDL
NOV	BDL	BDL	.	BDL	.	BDL
ETHYLBENZENE (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 2.4 (A3)		
JAN	BDL	BDL	.	BDL	.	BDL
MAR	BDL	.150 <T	.	.150 <T	.	!BT
MAY	.050 <T	.150 <T	.	.050 <T	.	BDL
JUL	BDL	BDL	.	BDL	.	BDL
SEP	BDL	BDL	.	.	.	BDL
NOV	BDL	BDL	.	BDL	.	.100 <T
M-XYLENE (UG/L)			DET'N LIMIT = 0.10	GUIDELINE = 300 (A3*)		
JAN	BDL	BDL	.	BDL	.	BDL
MAR	BDL	BDL	.	BDL	.	!BT
MAY	BDL	.100 <T	.	BDL	.	BDL
JUL	BDL	BDL	.	BDL	.	BDL
SEP	BDL	BDL	.	.	.	BDL
NOV	BDL	BDL	.	BDL	.	BDL
STYRENE (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 100 (D1)		
JAN	.050 <T	BDL	.	BDL	.	BDL
MAR	.050 <T	.300 <T	.	.200 <T	.	!BT
MAY	.050 <T	.250 <T	.	.150 <T	.	BDL
JUL	BDL	BDL	.	BDL	.	BDL
SEP	BDL	BDL	.	.	.	BDL
NOV	.050 <T	BDL	.	.050 <T	.	.150 <T
CHLOROFORM (UG/L)			DET'N LIMIT = 0.20	GUIDELINE = 350 (A1+)		
JAN	.500 <T	33.600	.	32.700	.	51.700
MAR	.400 <T	38.200	.	35.600	.	!BT
MAY	.100 <T	104.400	.	88.500	.	80.600
JUL	.100 <T	219.200	.	195.600	.	208.600
SEP	BDL	145.000	.	.	.	147.100
NOV	2.200	106.500	.	92.900	.	100.900

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM OTTAWA WSS (BRITANNIA) 1990

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 2	
			STANDING	FREE FLOW	STANDING	FREE FLOW
111, TRICHLOROETHANE (UG/L)			DET'N LIMIT = 0.02	GUIDELINE = 200 (D1)		
JAN	.020 <T	BDL	.	BDL	.	BDL
MAR	BDL	BDL	.	BDL	.	IBT
MAY	BDL	BDL	.	BDL	.	BDL
JUL	BDL	BDL	.	BDL	.	BDL
SEP	BDL	BDL	.	.	.	BDL
NOV	BDL	BDL	.	BDL	.	BDL
DICHLOROBROMOMETHANE (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 350 (A1+)		
JAN	BDL	.650	.	.700	.	.900
MAR	BDL	.750	.	.850	.	IBT
MAY	BDL	1.350	.	1.450	.	1.300
JUL	BDL	2.800	.	2.500	.	2.450
SEP	BDL	2.900	.	.	.	2.500
NOV	BDL	1.900	.	1.800	.	1.650
TOTL TRIHALOMETHANES (UG/L)			DET'N LIMIT = 0.50	GUIDELINE = 350 (A1)		
JAN	.550 <T	34.300	.	33.400	.	52.550
MAR	BDL	38.950	.	36.450	.	IBT
MAY	BDL	105.750	.	89.900	.	81.900
JUL	BDL	222.000	.	198.100	.	211.050
SEP	BDL	147.900	.	.	.	149.600
NOV	2.200 <T	108.400	.	94.650	.	102.550

TRACE LEVELS OF TOLUENE ARE LABORATORY ARTIFACTS DERIVED FROM THE ANALYTICAL METHODOLOGY.

TRACE LEVELS OF STYRENE ARE CONSIDERED TO BE LABORATORY ARTIFACTS RESULTING FROM THE LABORATORY SHIPPING CONTAINERS.

TABLE 6
DRINKING WATER SURVEILLANCE PROGRAM 1990

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE
BACTERIOLOGICAL			
FECAL COLIFORM MEMBRANE FILTRATION	CT/100ML	0	0 (A1)
STANDARD PLATE COUNT MEMBRANE FILT.	CT/ML	0	500/ML (A3)
TOTAL COLIFORM BACKGROUND MF	CT/100ML	0	N/A
TOTAL COLIFORM MEMBRANE FILTRATION	CT/100ML	0	5/100ML (A1)
CHEMISTRY (FLD)			
FIELD COMBINED CHLORINE RESIDUAL	MG/L	0	N/A
FIELD TOTAL CHLORINE RESIDUAL	MG/L	0	N/A
FIELD FREE CHLORINE RESIDUAL	MG/L	0	N/A
FIELD PH	DMNSLESS	N/A	6.5-8.5 (A3)
FIELD TEMPERATURE	DEG.C	N/A	15.0 (A3)
FIELD TURBIDITY	FTU	N/A	1.0 (A1)
CHEMISTRY (LAB)			
ALKALINITY	MG/L	0.2	30-500 (A3)
AMMONIUM TOTAL	MG/L	0.002	0.05 (F2)
CALCIUM	MG/L	0.2	100 (F2)
CHLORIDE	MG/L	0.2	250 (A3)
COLOUR	TCU	0.5	5.0 (A3)
CONDUCTIVITY	UMHO/CM	1.0	400 (F2)
CYANIDE	MG/L	0.001	0.2 (A1)
DISSOLVED ORGANIC CARBON	MG/L	0.1	5.0 (A3)
FLUORIDE	MG/L	0.01	2.4 (A1)
HARDNESS	MG/L	0.5	80-100 (A4)
LANGELIERS INDEX	DMNSLESS	N/A	N/A
MAGNESIUM	MG/L	0.1	30.0 (F2)
NITRITE	MG/L	0.001	1.0 (A1)
NITROGEN TOTAL KJELDAHL	MG/L	0.02	N/A
PH	DMNSLESS	N/A	6.5-8.5 (A4)
PHOSPHORUS FIL REACT	MG/L	0.0005	N/A
PHOSPHORUS TOTAL	MG/L	0.002	0.4 (F2)
SODIUM	MG/L	0.2	200 (A4)
SULPHATE	MG/L	0.2	500 (A3)
TOTAL NITRATES	MG/L	0.005	10.0 (A1)
TURBIDITY	FTU	0.05	1.0 (A1)
CHLOROAROMATICS			
123 TRICHLOROBENZENE	NG/L	5.0	N/A
1234 TETRACHLOROBENZENE	NG/L	1.0	N/A
1235 TETRACHLOROBENZENE	NG/L	1.0	N/A
124 TRICHLOROBENZENE	NG/L	5.0	10000 (I)
1245-TETRACHLOROBENZENE	NG/L	1.0	38000 (D4)
135 TRICHLOROBENZENE	NG/L	5.0	N/A
236 TRICHLOROTOLUENE	NG/L	5.0	N/A
245 TRICHLOROTOLUENE	NG/L	5.0	N/A
26A TRICHLOROTOLUENE	NG/L	5.0	N/A
HEXACHLOROBENZENE	NG/L	1.0	10 (C1)
HEXACHLOROBUTADIENE	NG/L	1.0	450 (D4)
HEXACHLOROCYCLOPENTADIENE	NG/L	5.0	206000 (D4)
HEXACHLOROETHANE	NG/L	1.0	1900 (D4)
OCTACHLOROSTYRENE	NG/L	1.0	N/A
PENTACHLOROBENZENE	NG/L	1.0	74000 (D4)
CHLOROPHENOLS			
234 TRICHLOROPHENOL	NG/L	100.0	N/A
2345 TETRACHLOROPHENOL	NG/L	20.0	N/A
2356 TETRACHLOROPHENOL	NG/L	10.0	N/A

TABLE 6
DRINKING WATER SURVEILLANCE PROGRAM 1990

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE
245 TRICHLOROPHENOL	NG/L	100.0	2600000 (D4)
246 TRICHLOROPHENOL	NG/L	20.0	5000 (A1)
PENTACHLOROPHENOL	NG/L	10.0	60000 (A1)
METALS			
ALUMINUM	UG/L	0.10	100 (A4)
ANTIMONY	UG/L	0.05	146 (D4)
ARSENIC	UG/L	0.10	25 (A1)
BARIUM	UG/L	0.05	1000 (A2)
BERYLLIUM	UG/L	0.05	6800 (D4)
BORON	UG/L	2.00	5000 (A1)
CADMIUM	UG/L	0.05	5 (A1)
CHROMIUM	UG/L	0.50	50 (A1)
COBALT	UG/L	0.02	N/A
COPPER	UG/L	0.50	1000 (A3)
IRON	UG/L	6.00	300 (A3)
LEAD	UG/L	0.05	10 (A1)
MANGANESE	UG/L	0.05	50 (A3)
MERCURY	UG/L	0.02	1 (A1)
MOLYBDENUM	UG/L	0.05	N/A
NICKEL	UG/L	0.20	350 (D3)
SELENIUM	UG/L	1.00	10 (A1)
SILVER	UG/L	0.05	50 (A1)
STRONTIUM	UG/L	0.10	N/A
THALLIUM	UG/L	0.05	13 (D4)
TITANIUM	UG/L	0.50	N/A
URANIUM	UG/L	0.05	100 (A1)
VANADIUM	UG/L	0.05	N/A
ZINC	UG/L	0.20	5000 (A3)
PAH			
ANTHRACENE	NG/L	1.0	N/A
BENZO(A) ANTHRACENE	NG/L	20.0	N/A
BENZO(A) PYRENE	NG/L	5.0	10.0 (A1)
BENZO(B) CHRYSENE	NG/L	2.0	N/A
BENZO(B) FLUORANTHENE	NG/L	10.0	N/A
BENZO(E) PYRENE	NG/L	50.0	N/A
BENZO(G,H,I) PERYLENE	NG/L	20.0	N/A
BENZO(K) FLUORANTHENE	NG/L	1.0	N/A
CHRYSENE	NG/L	50.0	N/A
CORONENE	NG/L	10.0	N/A
DIBENZO(A,H) ANTHRACENE	NG/L	10.0	N/A
DIMETHYL BENZO(A) ANTHRACENE	NG/L	5.0	N/A
FLUORANTHENE	NG/L	20.0	42000.0 (D4)
INDENO(1,2,3-C,D) PYRENE	NG/L	20.0	N/A
PERYLENE	NG/L	10.0	N/A
PHENANTHRENE	NG/L	10.0	N/A
PYRENE	NG/L	20.0	N/A
PESTICIDES & PCB			
ALACHLOR (LASSO)	NG/L	500.0	5000 (A2)
ALDRIN	NG/L	1.0	700 (A1)
ALPHA HEXACHLOROCYCLOHEXANE (BHC)	NG/L	1.0	700 (G)
ALPHA CHLORDANE	NG/L	2.0	7000 (A1)
AMETRINE	NG/L	50.0	300000 (D3)
ATRATONE	NG/L	50.0	N/A
ATRAZINE	NG/L	50.0	60000 (A2)
DES ETHYL ATRAZINE	NG/L	200.0	60000 (A2)
BETA HEXACHLOROCYCLOHEXANE (BHC)	NG/L	1.0	300 (G)
CYANAZINE (BLADEX)	NG/L	100.0	10000 (A2)
O,P-DDD	NG/L	5.0	10 (I)
DIELDRIN	NG/L	2.0	700 (A1)
ENDOSULFAN 1 (THIODAN I)	NG/L	2.0	74000 (D4)
ENDOSULFAN 2 (THIODAN II)	NG/L	5.0	74000 (D4)

TABLE 6
DRINKING WATER SURVEILLANCE PROGRAM 1990

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE
ENDOSULFAN SULPHATE (THIODAN SULPHATE)	NG/L	5.0	N/A
ENDRIN	NG/L	5.0	1600 (D3)
GAMMA CHLORDANE	NG/L	2.0	7000 (A1)
HEPTACHLOR	NG/L	1.0	3000 (A1)
HEPTACHLOR EPOXIDE	NG/L	1.0	3000 (A1)
LINDANE (GAMMA BHC)	NG/L	1.0	4000 (A1)
METHOXYCHLOR	NG/L	5.0	900000 (A1)
METOLACHLOR	NG/L	500.0	50000 (A2)
METRIBUZIN (SENCOR)	NG/L	100.0	80000 (A1)
MIREX	NG/L	5.0	N/A
P,P-DDD	NG/L	5.0	N/A
O,P-DDT	NG/L	5.0	30000 (A1)
OXYCHLORDANE	NG/L	2.0	N/A
PCB	NG/L	20.0	3000 (A2)
PPDDE	NG/L	1.0	30000 (A1)
PPDDT	NG/L	5.0	30000 (A1)
PROMETONE	NG/L	50.0	52500 (D3)
PROMETRYNE	NG/L	50.0	1000 (A2)
PROPAZINE	NG/L	50.0	700000 (D3)
SIMAZINE	NG/L	50.0	10000 (A2)
D-ETHYL SIMAZINE	NG/L	200.0	10000 (A2)
TOXAPHENE	NG/L	500.0	5000 (A1)
PHENOLICS			
PHENOLICS (UNFILTERED REACTIVE)	UG/L	0.2	2 (A4)
SPECIFIC PESTICIDES			
2,4 D PROPIONIC ACID	NG/L	100.	N/A
2,4,5-TRICHLOROPHENOXY ACETIC ACID	NG/L	50.	280000 (A1)
2,4-DICHLOROBUTYRIC ACID (2,4-D)	NG/L	100.	100000 (A1)
24-DICHLORORPHENOXYBUTYRIC ACID (24-DB)	NG/L	200.	18000 (B3)
BUTYLATE (SUTAN)	NG/L	2000.	245000 (D3)
CARBARYL (SEVIN)	NG/L	200.	90000 (A1)
CARBOFURAN	NG/L	2000.	90000 (A1)
CHLORPYRIFOS (DURSBAN)	NG/L	20.	N/A
CICP (CHLORPROPHAM)	NG/L	2000.	350000 (G)
DIALLATE	NG/L	2000.	N/A
DIAZINON	NG/L	20.	20000 (A1)
DICAMBA	NG/L	50.	120000 (A1)
DICHLOROVOS	NG/L	20.	N/A
EPTAM	NG/L	2000.	N/A
ETHION	NG/L	20.	35000 (G)
IPC	NG/L	2000.	N/A
MALATHION	NG/L	20.	190000 (A1)
METNYL PARATHION	NG/L	50.	7000 (B3)
METHYLTRITHION	NG/L	20.	N/A
MEVINPHOS	NG/L	20.	N/A
PARATHION	NG/L	20.	50000 (A1)
PHORATE (THIMET)	NG/L	20.	2000 (A2)
PROPOXUR (BAYGON)	NG/L	2000.	140000 (D3)
RELDAN	NG/L	20.	N/A
RONNEL	NG/L	20.	N/A
SILVEX (2,4,5-TP)	NG/L	20.	10000 (A1)
VOLATILES			
1,1 DICHLOROETHANE	UG/L	0.10	N/A
1,1 DICHLOROETHYLENE	UG/L	0.10	7 (D1)
1,2 DICHLOROBENZENE	UG/L	0.05	200 (A1)
1,2 DICHLOROETHANE	UG/L	0.05	5 (A1)

TABLE 6
DRINKING WATER SURVEILLANCE PROGRAM 1990

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE
1,2 DICHLOROPROPANE	UG/L	0.05	5 (D1)
1,3 DICHLOROBENZENE	UG/L	0.10	3750 (D3)
1,4 DICHLOROBENZENE	UG/L	0.10	5 (A1)
111, TRICHLOROETHANE	UG/L	0.02	200 (D1)
112 TRICHLOROETHANE	UG/L	0.05	0.6 (D4)
1122 TETRACHLOROETHANE	UG/L	0.05	0.17(D4)
BENZENE	UG/L	0.05	5 (A1)
BROMOFORM	UG/L	0.20	350 (A1+)
CARBON TETRACHLORIDE	UG/L	0.20	5 (A1)
CHLOROBENZENE	UG/L	0.10	1510 (D3)
CHLORODIBROMOMETHANE	UG/L	0.10	350 (A1+)
CHLOROFORM	UG/L	0.10	350 (A1+)
DICHLOROBROMOMETHANE	UG/L	0.05	350 (A1+)
ETHLYENE DIBROMIDE	UG/L	0.05	50 (D1)
ETHYLBENZENE	UG/L	0.05	2.4 (A3)
M-XYLENE	UG/L	0.10	300 (A3*)
METHYLENE CHLORIDE	UG/L	0.50	50 (A1)
O-XYLENE	UG/L	0.05	300 (A3*)
P-XYLENE	UG/L	0.10	300 (A3*)
STYRENE	UG/L	0.05	100 (D1)
TETRACHLOROETHYLENE	UG/L	0.05	5 (D1)
TRANS 1,2 DICHLOROETHYLENE	UG/L	0.10	70 (D1)
TOLUENE	UG/L	0.05	24 (A3)
TOTAL TRIHALOMETHANES	UG/L	0.50	350 (A1)
TRICHLOROETHYLENE	UG/L	0.10	50 (A1)

Appendix A

DRINKING WATER SURVEILLANCE PROGRAM
PROGRAM DESCRIPTION

The Drinking Water Surveillance Program (DWSP) for Ontario monitors drinking water quality at municipal water supply systems. The DWSP Database Management System provides a computerized drinking water quality information system for the supplies monitored. The objectives of the program are to provide:

- immediate, reliable, current information on drinking water quality;
- a flagging mechanism for guideline exceedance;
- a definition of contaminant levels and trends;
- a comprehensive background for remedial action;
- a framework for assessment of new contaminants; and
- an indication of treatment efficiency of plant processes.

PROGRAM

The DWSP officially began in April 1986 and is designed to eventually include all municipal water supplies in Ontario. In 1990, 76 systems were being monitored. Water supply locations have been prioritized for surveillance based primarily on criteria such as population density, probability of contamination and geographical location.

An ongoing assessment of future monitoring requirements at each location will be made. Monitoring will continue at the initial locations at an appropriate level and further locations will be phased into the program as resources permit.

A major goal of the program is to collect valid water quality data in context with plant operational characteristics at the time of sampling. As soon as sufficient data have been accumulated and analyzed, both the frequency of sampling and the range of parameters may be adjusted accordingly.

Assessments are carried out at all locations prior to initial sampling, in order to acquire complete plant process and distribution system details and to designate (and retrofit if necessary) all sampling systems and locations. This ensures that the sampled water is a reflection of the water itself.

Samples are taken of raw (ambient water) and treated water at the treatment plant and of consumer's tap water in the distribution system. In order to determine possible effects of distribution on water quality, both standing and free flow water in old and new sections of the distribution system are sampled. Sampling is carried out by operational personnel who have been trained in applicable procedures.

Comprehensive standardized procedures and field test kits are supplied to sampling personnel. This ensures that samples are taken and handled according to standard protocols and that field testing will supply reliable data. All field and laboratory analyses are carried out using "approved documented procedures". Most laboratory analyses are carried out by the Ministry of Environment (MOE), Laboratory Services Branch. Radionuclides are analyzed by the Ministry of Labour.

DATA REPORTING MECHANISM

When the analytical results are transferred from the MOE laboratory into the DWSP system, printouts of the completed analyses are sent to the MOE District Officer, the appropriate operational staff and are also retained by the DWSP unit.

PROGRAM INPUTS AND OUTPUTS

There are four major inputs and four major outputs in the program.

Program Input - Plant and Distribution System Description

The system description includes plant specific non-analytical information acquired through a questionnaire and an initial plant visit. During the initial assessment of the plant and distribution system, questionnaire content is verified and missing information added. It is intended that all data be kept current with scheduled annual updates.

The Plant and Distribution System Description consists of the following seven components:

1. PROCESS COMPONENT INVENTORY
All physical and chemical processes to which the water is subjected, from the intake pipe to the consumers' tap (where possible), are documented. These include: process type, general description of physical structures, material types, sizes, and retention time for each process within the plant. The processes may be as simple as transmission or as complex as carbon adsorption.

2. TREATMENT CHEMICALS

Chemicals used in the treatment processes, their function, application point, supplier and brand-name are recorded. Chemical dosages applied on the day of sampling are recorded in DWSP.

3. PROCESS CONTROL MEASUREMENTS

Documentation of in-plant monitoring of process parameters (eg. turbidity, chlorine residuals, pH, aluminum residuals) including methods used, monitoring locations and frequency is contained in this section. Except for the recorded Field Data, in-plant monitoring results are not retained in DWSP but are retained by the water treatment plant personnel.

4. DESIGN FLOW AND RETENTION TIME

Hydraulic capacity, designed and actual, is noted here. Retention time (the time that a block of water is retained in the plant) is also noted. Maximum, minimum and average flow, as well as a record of the flow rate on the day of sampling, are recorded in DWSP.

5. DISTRIBUTION SYSTEM DESCRIPTION

This area includes the storage and transmission characteristics of the distribution system after the water leaves the plant.

6. SAMPLING SYSTEM

Each plant is assessed for its adequacy in terms of the sampling of bacteriological, organic and inorganic parameters. Prime considerations in the assessment and design of the sampling system are:

i/ the sample is an accurate representation of the actual water condition, eg. raw water has had no chemical treatment;

ii/ the water being sampled is not being modified by the sampling system;

iii/ the sample tap must be in a clean area of the plant, preferably a lab area; and

iv/ the sample lines must be organically inert (no plastic, ideally stainless steel).

It is imperative that the sampled water be a reflection not of the sampling system but of the water itself.

The sampling system documentation includes: origin of the water; date sampling was initiated; size, length and material type (intake,

discharge and tap); pump characteristics (model, type, capacity); and flow rate.

7. PERSONNEL
This section contains the names, addresses and phone numbers of current plant management and operational staff, distribution system management and operational staff, Medical Officer of Health and appropriate MOE personnel associated with the plant.

Program Input - Field Data

The second major input to DWSP is field data. Field data is collected at the plant and from the distribution system sites on the day of sampling. Field data consists of general operating conditions and the results of testing for field parameters. General operating conditions include chemicals used, dosages, flow and retention time on the day of sampling, as well as, monthly maximum, minimum and average flows. Field parameters include turbidity, chlorine residuals (free, combined and total), temperature and pH. These parameters are analyzed according to standardized DWSP protocols to allow for interplant comparison.

Program Input - Laboratory Analytical Data

The third major input to DWSP is Laboratory Analytical Data. Samples gathered from the raw, treated and distribution sampling sites are analyzed for the presence of approximately 180 parameters at a frequency of two to twelve times per year. Sixty-five percent of the parameters are organic. Parameters measured may have health or aesthetic implications when present in drinking water. Many of the parameters may be used in the treatment process or may be treatment by-products. Due to the nature of certain analytical instruments, parameters may be measured in a "scan" producing some results for parameters that are not on the DWSP priority list, but which may be of interest. The majority of parameters are measured on a routine basis. Those that are technically more difficult and/or costly to analyze, however, are done less frequently. These include Specific Pesticides and Chlorophenols.

Although the parameter list is extensive, additional parameters with the potential to cause health or aesthetic related problems may be added provided reliable analytical and sampling methods exist.

All laboratory generated data is derived from standardized, documented analytical protocols. The analytical method is an integral part of the data and as methods change, notation will be made and comparison data documented.

Program Input - Parameter Reference Information

The fourth major input to DWSP is Parameter Reference Information. This is a catalogue of information for each substance analyzed on DWSP. It includes parameter name and aliases, physical and chemical properties, basic toxicology, world-wide health limits, treatment methods and uses. The Parameter Reference Information is computerized and can be accessed through the Query function of the DWSP database. An example is shown in figure 1.

Program output - Query

All DWSP information is easily accessed through the Query function, therefore, anything from addresses of plant personnel to complete water quality information for a plant's water supply is instantly available. The DWSP computer system makes relatively complex inquiries manageable. A personal password allowing access into the DWSP query mode in all MOE offices is being developed by the DWSP group.

Program Output - Action Alerts

Drinking Water quality in Ontario is evaluated against provincial objectives as outlined in the Ontario Drinking Water Objectives publication. Should the reported level of a substance in treated water exceed the Ontario Drinking Water Objective, an "Action Alert" requiring resampling and confirmation is issued. This assures that operational staff, health authorities and the public are notified as soon as possible of the confirmation of an exceedance and remedial action taken. This report supplies a history of the occurrence of past exceedances at the plant plus a historical summary on the parameter of concern.

In the absence of Ontario Drinking Water Objectives, guidelines/limits from other agencies are used. The Parameter Listing System, published by MOE (ISBN 0-7729-4461-X), catalogues and keeps current guidelines for 650 parameters from agencies throughout the world. If these guidelines are exceeded, the results are flagged and evaluated by DWSP personnel. An "Action Alert" will be issued if warranted.

Program Output - Report Generation

Custom reports can be generated from DWSP to meet MOE Regional needs and to respond to public requests.

Program Output - Annual Reports

It is the practice of DWSP to produce an annual report containing analytical data along with companion plant information.

FIG.1

MOE - DRINKING WATER ASSESSMENT PROGRAM (DWSP)

PARAMETER REFERENCE INFORMATION

BENZENE (B2001P) VOLATILES

CLASS: HEALTH METHOD: POCODO UNIT: µg/L

SOURCE	FROM	TO	METHOD	GUIDELINE	UNIT	NOTE
CAL C	85/01			0.700	µg/L	AL
CDWG C	87/01			5.000	µg/L	MAC
EPA C	87/07			5.000	µg/L	MCL
EPAA C	80/11			6.600	µg/L	AMBIENT **
FERC C	84/05			1.000	µg/L	MCL
WHO C	84/01			10.000	µg/L	GV

DESCRIPTION: **NAME:** BENZENE
CAS#: 71-43-2
MOLECULAR FORMULAE: C_6H_6
DETECTION LIMIT: (FOR METHOD POCODO) 0.05 µg/L
SYNONYMS: BENZOL; BENZOLE; COAL NAPHTHA; CARBON OIL (27). CYCLOHEXATRIENE (41).
CHARACTERISTICS: COLOURLESS TO LIGHT-YELLOW, MOBILE, NON-POLAR LIQUID, OF HIGHLY REFRACTIVE NATURE, AROMATIC ODOUR; VAPOURS BURN WITH SMOKING FLAME (30).
PROPERTIES: SOLUBILITY IN WATER: 1780-1800 mg/L AT 25C (41). THRESHOLD ODOUR: 0.5 - 10 PPM IN WATERTHRESHOLD TASTE: 0.5 mg/L IN WATER (39).
ENVIRONMENTAL FATE: MAY BIOACCUMULATE IN LIVING ORGANISMS AND APPEARS TO ACCUMULATE IN ANIMAL TISSUES THAT EXHIBIT A HIGH LIPID CONTENT OR REPRESENT MAJOR METABOLIC SITES, SUCH AS LIVER OR BRAIN; SMALL QUANTITIES EVAPORATE FROM SOILS OR ARE DEGRADED RATHER QUICKLY (80).
SOURCES: COMMERCIAL: PETROLEUM REFINING; SOLVENT RECOVERY; COAL TAR DISTILLATION (39); FOOD PROCESSING AND TANNING INDUSTRIES; COMBUSTION OF CAR EXHAUST.
ENVIRONMENTAL: POSSIBLE SOURCE IS RUNOFF.

USES: DETERGENTS; NYLON; INTERMEDIATE IN PRODUCTION OF OTHER COMPOUNDS, SUCH AS PESTICIDES; SOLVENT FOR EXTRACTION AND RECTIFICATION IN RUBBER INDUSTRY; DEGREASING AND CLEANSING AGENT; GASOLINE.

TOXICITY: RATING: 4 (VERY TOXIC).
ACUTE: IRRITATING TO MUCOUS MEMBRANES; SYMPTOMS INCLUDE RESTLESSNESS, CONVULSIONS, EXCITEMENT, DEPRESSION; DEATH MAY FOLLOW RESPIRATORY FAILURE.
CHRONIC: MAY CAUSE ANAEMIA AND LEUKAEMIA (45); MUTAGENIC.
MODE OF ACTION: CHROMOABERRATION IN LYMPHOCYTE CULTURES.

CARCINOGENICITY: A KNOWN HUMAN CARCINOGEN.

REMOVAL: THE FOLLOWING PROCESSES HAVE BEEN SUCCESSFUL IN REMOVING BENZENE FROM WASTEWATER: GAC ADSORPTION, PRECIPITATION WITH ALUM AND SUBSEQUENT REMOVAL VIA SEDIMENTATION, COAGULATION AND FLOCCULATION, SOLVENT EXTRACTION, OXIDATION

ADDITIONAL PROPERTIES:
MOLECULAR WEIGHT: 78.12
MELTING POINT: 5.5°C (27).
BOILING POINT: 80.1°C (27).
SPECIFIC GRAVITY: 0.8790 AT 20°C (27).
VAPOUR PRESSURE: 100 MM AT 26.1°C (27).
HENRY'S LAW CONSTANT: 0.00555 ATM-M3/MOLE (41).
LOG OCT./WATER PARTITION COEFFICIENT: 1.95 TO 2.13 (39).
CARBON ADSORPTION: K=1.0; 1/N=1.6; R=0.97; PH=5.3 (41)SEDIMENT/WATER PARTITION COEFFICIENT: NO DATA

NOTES: EPA PRIORITY POLLUTANT.

Appendix B

DWSP SAMPLING GUIDELINE

i) Raw and Treated at Plant

General Chemistry	-500 mL plastic bottle (PET 500) -rinse bottle and cap with sample water three times -fill to 2 cm from top
Bacteriological	-220 mL plastic bottle with white seal on cap -do <u>not</u> rinse bottle, preservative has been added -avoid touching bottle neck or inside of cap -fill to top of red label as marked
Metals	-500 mL plastic bottle (PET 500) -rinse bottle and cap three times -fill to 2 cm from top -add 10 drops nitric acid (HNO_3) (**Caution:** HNO_3 is corrosive)
Volatiles (duplicates) (OPOPUP)	-45 mL glass vial with septum (teflon side must be in contact with sample) -do <u>not</u> rinse bottle -fill bottle completely without bubbles
Organics (OWOC),(OWTRI),(OAPAHX)	-1 L amber glass bottle per scan -do <u>not</u> rinse bottle -fill to 2 cm from top -when 'special pesticides' are requested three extra bottles must be filled

Cyanide	-500 mL plastic bottle (PET 500) -rinse bottle and cap three times -fill to 2 cm from top -add 10 drops sodium hydroxide (NaOH) (**Caution:** NaOH is corrosive)
Mercury	-250 mL glass bottle -rinse bottle and cap three times -fill to top of label -add 20 drops each nitric acid (HNO_3) and potassium dichromate ($K_2Cr_2O_7$) (**Caution:** HNO_3&$K_2Cr_2O_7$ are corrosive)
Phenols	-250 mL glass bottle -do <u>not</u> rinse bottle, preservative has been added -fill to top of label
Radionuclides (as scheduled)	-4 L plastic jug -do <u>not</u> rinse, carrier added -fill to 5 cm from top
Organic Characterization (GC/MS - once per year)	-1 L amber glass bottle; instructions as per organic -250 mL glass bottle -do <u>not</u> rinse bottle -fill completely without bubbles

<u>Steps:</u>

1. Let sampling water tap run for an adequate time to clear the sample line.

2. Record time of day on submission sheet.

3. Record temperature on submission sheet.

4. Fill up all bottles as per instructions.

5. Record chlorine residuals (free, combined and total for treated water only), turbidity and pH on submission sheet.

ii) Distribution Samples (standing water)

General Chemistry	-500 mL plastic bottle (PET 500) -rinse bottle and cap with sample water three times -fill to 2 cm from top
Metals	-500 mL plastic bottle (PET 500) -rinse bottle and cap three times -fill to 2 cm from top -add 10 drops nitric acid (HNO_3) (**Caution:** HNO_3 is corrosive)

Steps:

1. Record time of day on submission sheet.
2. Place bucket under tap and open cold water.
3. Fill to predetermined volume.
4. After mixing the water, record the temperature on the submission sheet.
5. Fill general chemistry and metals bottles.
6. Record chlorine residuals (free, combined and total), turbidity and pH on submission sheet.

iii) Distribution Samples (free flow)

General Chemistry	-500 mL plastic bottle (PET 500) -rinse bottle and cap with sample water three times -fill to 2 cm from top
Bacteriological	-250 mL plastic bottle with white seal on cap -do <u>not</u> rinse bottle, preservative has been added -avoid touching bottle neck or inside of cap -fill to top of red label as marked

Metals	-500 mL plastic bottle (PET 500) -rinse bottle and cap three times -fill to 2 cm from top -add 10 drops nitric acid HNO_3 (**Caution:** HNO_3 is corrosive)
Volatiles (duplicate) (OPOPUP)	-45 mL glass vial with septum (teflon side must be in contact with sample) -do <u>not</u> rinse bottle, preservative has been added -fill bottle completely without bubbles
Organics (OWOC) (OAPAHX)	-1 L amber glass bottle per scan -do <u>not</u> rinse bottle -fill to 2 cm from top

<u>Steps:</u>

1. Record time of day on submission sheet.

2. Let cold water flow for five minutes.

3. Record temperature on submission sheet.

4. Fill all bottles as per instructions.

5. Record chlorine residuals (free, combined and total), turbidity and pH on submission sheet.